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ABSTRACT

The proceedings of a conference on occupational stress are contained in this report. Presentation titles include the following: "Basic Concepts of Organizational Stress--Causes and Problems," "Occupational Sources of Stress: A Review of the Literature Relating to Coronary Heart Disease and Mental Ill Health," "A Review of [National Institute for Occupational Safety and Health] Psychological Stress Research--1977," "The Health Consequences of Shift Work," "Heart Stress: The Concept of Types A and B," "Stress Management at TRW [Defense and Space Systems Grays]," "The Stress Reduction Program at University Hospital, University of California Medical Center, San Diego," "A Unique Approach to Stress Reduction: Application of Biofeedback," "Application of Biofeedback--A Discussion," and "Summary - Where Do We Go From Here," (two summaries provided). (JH)

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Proceedings of the Conference on Occupational Stress
Los Angeles, November 3, 1977

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ABSTRACT

This volume contains the proceedings of a conference on occupational stress, a subject of increasing concern.

The psychological causes and problems of occupational stress are examined; situations leading to feelings of insecurity and inadequacy along with role incongruity are seen as stress producers.

Recent NIOSH psychological stress research is reviewed. These studies include stress-related disease and mental health incidence rates by occupation, mass psychogenic contagion reaction in industry and the relationship of machine pacing and stress.

A study of the health consequences of shiftwork found no evidence that shiftworkers suffered from severe health problems, however, shiftwork might be related to decreased psychological well-being.

The personality profile of individuals prone to develop heart disease is discussed. Physicians must learn to recognize this "Type A" behavior pattern. Ongoing stress management programs--one in an aerospace company, one in a hospital--are described. Biofeedback, as one successful approach to stress reduction, is described and discussed.

The preceding presentations are reviewed and implications for further study and action are set forth. Stressors specific to the individual work situation should be identified; the interaction between job-stressors and other life-stressors must be considered, particularly for working women. Physicians must be sensitized to signs of stress; and managers must be made aware of their impact on the feelings of employees.

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INTRODUCTION

Stress--the body's physical, mental, and chemical reactions to events that impinge on the individual from within or without--has become a subject of concern. An uncertain, rapidly changing world has provided an environment of increased stress, one in which individuals are having difficulty coping productively.

Increasing attention is now being given to occupational stress--stress resulting from aspects of the job or workplace. The magnitude of the problem is becoming a matter of concern not only to those directly involved with the health of the employee, but also to the employer, who often bears the cost of the problem.

The causes and effects of occupational stress were examined and discussed by experts in the field at a conference cosponsored by the UCLA Institute of Industrial Relations and the National Institute for Occupational Safety and Health. Researchers, doctors, and practitioners in the area of occupational stress contributed their findings, ideas, and experiences at this conference, held in Los Angeles in November, 1977. We recorded and transcribed their remarks in order to present them in this volume. We hope that they stimulate thought and perhaps lead to some solutions to a complex problem.

BASIC CONCEPTS OF ORGANIZATIONAL STRESS--CAUSES AND PROBLEMS

Warren H. Schmidt, Ph.D.*

We all know we are living in a time of turmoil, and living in organizations is a very confusing business. But I think one of the best ways of identifying the source of that confusion is to think about what happens in Chinese baseball. I don't know if any of you have played Chinese baseball, but it is played just like American baseball with one change in the rules: after the ball leaves the pitcher's hand, and until it hits the ground, you can move the bases. Now that one small change makes a big difference! Because if you are the batter, you not only have to keep your eye on the ball, but you have to watch what is happening at the bases. That seems to be a fairly accurate picture of what living in a world like ours, and particularly being a manager in a world like ours, is like these days. The bases are always being moved, creating a certain amount of tension and stress.

On the other side is our critical reaction to people's stress. Harry Truman's famous statement, "If you can't stand the heat, get out of the kitchen!" is probably one of the most potent statements about stress. The only problem is that there are some people who have to work in the kitchen, whether they like the heat or not. They must begin to think about how they can cope or fix things so that the kitchen isn't so hot. And I think that those who are concerned with occupational stress need to look at both sides of the coin--how we cope with stress and how we change the conditions so that stress may be reduced.

Following this paper is an excellent article by Cary Cooper and Judi Marshall, "Occupational sources of stress: a review of the literature relating to coronary heart disease and mental ill health." The authors have summarized all the key literature, and have put it together in an elegant model. What I would like to do is share with you some basic concepts that have occurred to me about stress. I shall try to indicate what the world of the manager looks like in dealing with stress, reporting on a very recent study that just came out on managers in the public sector.

Finally, I shall tell you about how some people prepare themselves to enter a very stressful situation. Recently I spent time with the National Football League officiating team at the 49'ers game--the six men who wear those black-and white stripes at the ball game and go into that very stressful decision-making arena. I learned some very interesting things about how they prepare themselves for that situation.

Let us now look at the positive and negative possibilities of stress. It is important to recognize that stress in itself is not necessarily undesirable.

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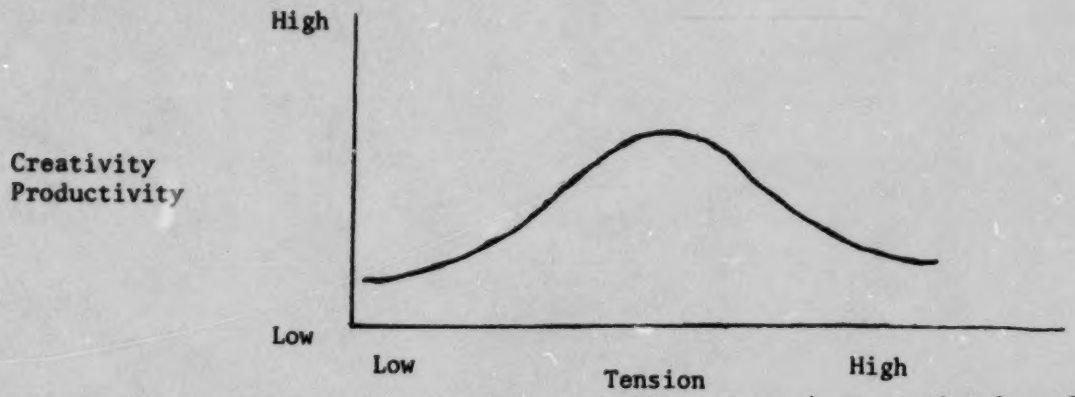
If we measure the degree of tension and plot it against creativity and productivity, we come up with the following sort of curve:



You are most creative and productive, not when you are in a completely relaxed condition, nor when you are in a highly tense position, but when you are somewhere in between. On the low stress side you get more apathy and there isn't the energy available to push for new solutions and new approaches to problems. On the other hand, if stress becomes too great, what tends to happen is that we begin to limit our vision psychologically, we're able to see fewer alternatives, and we tend to be more defensive and more rigid in our approach to things. So what we want to do is *manage* our level of tension so that it stays within an area where it is useful. Some very important things happen when people are under tension or stress. Physiologically, athletes break records during games when the stress is great. But when excess stress brings us to the down side of the performance curve, we have to rexamine what is happening.

I'm going to look at stress just from a psychological point of view. (The physiological side will be dealt with by others in the seminar.) It seems to me that we are moving toward the down side of the curve when our feelings of security and adequacy are threatened. To me, *security* and *adequacy* are two key words in all of our behavior. Most of us behave most appropriately and most effectively when we have relatively high feelings of security and adequacy.

The feeling of security depends on our reaction to our environment--its predictability and friendliness. How sure are we of what's going to happen? We feel more secure if we can predict more accurately, if we can anticipate what's going to happen.

The other aspect of security is the degree of acceptance and understanding that we experience in our environment. When we are with people who make us feel secure (we know that we can trust them, they care about us, they will not hurt us or try to embarrass us) we can use our full energy to focus on a problem. When we are insecure--when we are worried about people's reactions to us--then we have to use some energy to protect ourselves and we experience stress.

The other feeling that is important is the feeling of adequacy--the feeling that I can make a difference, that I can *influence* my environment, that I can do what is expected of me and handle things effectively. I am in control.

Stress (the *negative* kind of stress) occurs when we feel threats that lead to feelings of insecurity and inadequacy. That is when energy begins to be used nonproductively.

Let me describe briefly how this works in the world of the manager. The most important part of your environment, of course, is people, and it is from them you get your major feelings of security and some cues as to your adequacy.

Now let's look at some of the people in the world you live in who make a difference in how you feel about yourself. If I am a manager working in an organization I probably have at least one boss. He's an important person in my environment. How he feels about me is important. I also have some other people who make up my environment. There are subordinates--I am responsible for them. There are my peers and colleagues who expect certain things from me. I may have a wife or husband who is important to me. I have friends, neighbors, customers, clients, and so forth. (Every once in a while it is useful to plot the world you live in, i.e., the people who make a difference in how you feel about yourself.)

Now, every one of these people who deals with me develops an image of the kind of person I am. You talk to my subordinate, Mary, and ask her what kind of a boss she has, and she can tell you. Ask my colleagues about me, and they can tell you about me from their experience. And of course I carry within myself my own self-concept. My image of myself, the way I think about myself, how I define myself, is probably the most important ingredient of my whole personality in considering stress.

Each of these people I have mentioned develops his or her own image of me--the person they *think* is there--and they react to that person. As you know, one of the interesting things about human beings is that our perceptions are always partial. Some of our misbehavior toward one another occurs because we don't really know with whom we are dealing. Mary is relating to the boss she *thinks* is there, not to the boss as I see myself. Some of the tension in my environment comes from that kind of misunderstanding. Programs have been developed to help us sense better how other people see us. Knowing how others see us tends to reduce some kinds of stress in our lives, and increase other kinds of stress.

But the major kind of stress comes, not from the fact that we misperceive one another, but from the fact that all of the people in our environment have a notion of not only who we are, but also of *how we ought to be*. My wife could tell you how I could be improved or what a good spouse is. My boss has an idea of how a person in my position really ought to behave. All of the other people who live in my world have not only their image of me, but their expectations of how I ought to be--"I wish he would make decisions," "I wish he would delegate more," etc.

Part of the problem occurs because these ideal images of me are very often incongruent. How my boss would like me to be is very different from how my wife wants me to be. My boss wants somebody in my position to be fully committed and dedicated to the organization and not to let personal feelings get in the way of the job. My wife doesn't see it exactly that way. And all of these people try to influence me. In one way or another, by subtle and overt means, they try to move me to behave more in line with what they think I ought to be. Meanwhile, inside of me there is also the quest to become a different person, a growing person.

So there are pressures. We all get caught in this swirl of influence. We are surrounded by people who only partially understand us, who develop their notions

of how we ought to change, and sometimes try to move us in conflicting directions. One of the most common sources of occupational stress on the job is conflict within the role itself. Different people who deal with us expect us to behave in conflicting ways.

How do managers perceive all of this? In a recent study by Robert Pearse some 5,000 managers in the private sector identified some of the major causes of stress as they perceived them.* These have been divided into individually-oriented factors, interpersonally-oriented factors, and organizational factors.

As far as individually-oriented factors are concerned, the most common source of stress that managers report is the *fear of failing* on some specific assignment--the worry that "I won't be able to do what they expect me to do," "I'll be late," "The solution won't be as elegant as it ought to be," and so on. And I suspect that every one of us has experienced that kind of stress.

The second most important individually-oriented source was the *physical* and *emotional impact* of long hours, travel and deadlines, the things that, in effect, tear away at one's freedom and push one physically.

When you look at the interpersonally-oriented factors, you find that *inadequate support by superiors* is an important factor. If I don't feel that my boss--a key person in my life--supports me, understands me and appreciates me, I am more susceptible to a stressful experience. *Ineffective performance by my superiors* turns out to be another important factor in stress. If I don't think I have a competent boss, it is going to create problems for me. And if these two factors --incompetence and inadequate support--occur in the same person, then I've really got trouble. The chances are that he probably will pass on the blame for his ineffectiveness to me.

Inadequate performance from subordinates is the third key factor that managers report as contributing to their feelings of stress on the job.

Then there are a couple of organizationally-oriented factors that seem to be important. One is described as the *political climate* of the organization. There are organizations where there is a dog-eat-dog environment--one division is out to get another, the personal problems of one person begin to impact upon a whole set of relationships and there is a spillage of family problems into the organization.

Not knowing what is expected of me on the job emerges as one of the key factors. These factors of ambiguity and uncertainty are found in the literature, too. Not knowing what is really expected of me, if I am doing a good job, or even if I am doing the right job, along with uncertainty about what I am going to be held accountable for are the kinds of feelings that confront us, particularly when we move into a new job situation.

Not receiving the credit and recognition that is due me, along with inadequate information about career advancement requirements, tends to increase stress. "What do I need to do in order to move forward in this organization?" is an important question. And as you know, studies show that there is a high percentage of persons working at all levels of the organization who do not really know

* Robert Pearse, *What Managers Think About Their Managerial Careers* (New York: AMACOM, 1977)

how to move ahead because they have not been given that kind of information.

These, then tend to be the factors of stress that managers report in the recent study by Pearse. This study of 5,000 managers is just being released by the American Management Association. I find the key factors of security and adequacy threaded throughout the reported results of this study.

Let's now look at some of the causes of stress in public officials. A year ago I met with the League of California Cities, which includes both elected and non-elected officials from the cities of California. I asked the officials to define the things that cause them the greatest stress on the job. Out of some 500 responses, this is the picture that emerged. In order of frequency, the items reported were:

Time pressures. Having to get things done quickly and having to get numbers of things done almost simultaneously.

Conflict. Having a conflict or being challenged in public. One of the costs of being in the public sector is being exposed. You are put on a spot and lots of people can see how you respond or how well you are doing.

Insufficient information to make a decision. More and more, I think, all of us are finding ourselves in situations where there is no clear answer, where we feel that what we do is partly based on guesswork.

No one best solution. Although someone has said that there is no problem so confused and complicated that there isn't available, if you look for it, an answer that is clear, simple, attractive, and wrong! But for conscientious people, there are always lingering doubts as we make decisions. There is no one best solution available. We are always dealing with tradeoffs. Stress comes from that recognition, that awareness.

Competing loyalties. We want to help different people, we can identify with different groups and different people. However, at the decision point we have to opt for one and not the others.

Irrational and emotionally charged issues. Public officials frequently deal with irrational emotionally charged issues, and that intensifies the original problem.

Inability to get a point across. This is the kind of frustration that creates stress. This is particularly so when someone feels that this is a very important point for him to get across and doesn't feel really understood.

Inadequate staff performance preparation. Most of us are dependent upon other people to supply us with the accurate and full information we need.

When others try to manipulate, pressure, or deceive.

I'd like to come back to the notion that stress has either a positive or negative effect, depending on how it is understood and handled. There is a lot of energy

available in a stressful situation. It can be used either constructively or destructively. Let me give you an example. Stress is related to expectation. If *more is expected of me than I feel I can deliver,* then some negative things can happen. I may feel anxious and become defensive and resent those who will not accept my limitations. *But* it is also possible that I might stretch myself and really exceed my own predictions.

If others expect less of me than I feel I can deliver, there would be some negative possibilities. I can lower my own aspirations. I may become resentful toward those who demean me. *Or* I may set out to demonstrate their error--their expectations were too low.

If expectations are not clear, I may feel helpless and confused and become irresponsible. I may feel inadequate and insecure. *Or* I may use the freedom to define my own goals and my own rules to become more proactive. *If expectations are in conflict,* I may side with one set of expectations and reject the other. I may seek help and get some perspective. I may be immobilized. *Or,* I may confront the conflict and get parties together to resolve the issue.

So, in situations of stress, it is useful to consider the possibility of using the available energy positively or negatively.

I shall conclude by relating to you an interesting experience I recently had. I met with Jim Tunney and his crew of National Football League officials who do not always make popular decisions and who experience a great deal of stress in making those decisions very quickly on the job. In fact, they have thousands of people who are ready to comment on their decisions right after they make them. I was curious about how they prepare themselves for this event. They do it in the following way. Saturday night before the game, they meet in a hotel room. They go over the film from the last game at which they officiated. They have a record of every play along with comments from their supervisor, Art McNally. They go back and forth over those plays.

During that process, I noticed that they do a lot of supporting of each other. "That was a great call!" "Good placement of the ball!" "You were in the right spot!" and so on. Then they can handle the misplays that the supervisor has noted. It is a rigorous self-training as professionals. On Sunday morning they meet and intensively go over some set of rules. They have a three-page test which they all have had to fill out the week before--true-false and situational problems. They systematically go through all the applicable rules. They reinforce themselves and they discuss the underlying principles and strategies that they are following.

As I listened to them I thought to myself, "What a wonderful way of clarifying their role and to whom they are really responsible." They were able to use one another on the job to gain a sense of companionship and support on that field. With that they are able to move into that arena and handle a very stressful situation.

In summary we are looking at a very important area. Stress will grow as our lives become more complex. What we are dealing with is the unleashing of energy which we really need to understand better, so we can keep it within bounds. We must understand when we move from stress to distress. The research that will be reported to us will help us to understand better, and handle better, the stressful situations in our lives.

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Occupational sources of stress: a review of the literature relating to coronary heart disease and mental ill health

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A great deal of research has been conducted over recent years in the field of occupational stress and its relationship to physical and mental illness. This paper attempts to provide a framework for examining this work, with the dual objectives of broadening the existing psychological literature with the extensive medical data available and also highlighting the research gaps in this area. By emphasizing the medical evidence it is hoped that we may encourage greater interdisciplinary work in the growing field of stress at work.

Felton & Cole (1963) estimate that all cardiovascular diseases accounted for 12 per cent of the time lost by the 'working population' in the US, for a total economic loss of about $4 billion in a single year. A report (1969) by the Department of Health and Social Security in the UK shows, as Aldridge (1970) indicates, that the sum of incapacity for men suffering from mental, psychoneurotic and personality disorders, nervousness, debility and migraine headache accounted for 22·8 million work days lost in 1968 alone (second only to bronchitis in the league table of illness and lost working days). Coronary heart disease and mental ill health together, therefore, represent a serious cost for industry both in human and financial terms.

There is a growing body of evidence from studies in experimental laboratory settings (Kahn & Quinn, 1970) and in the workplace (Margolis, Kroes & Quinn, 1974) to suggest that occupational stress is a causal factor in these diseases. By occupational stress is meant negative environmental factors or stressors (e.g. work overload, role conflict/ambiguity, poor working conditions) associated with a particular job. In addition to the environmental precursors, inherent characteristics of the individual and his behaviours may also contribute to occupational ill health. In fact, as Jenkins (1971*a*) has suggested, the early clinical studies of psychosomatically oriented General Practitioners and psychiatrists led to a number of theories about a predisposing state of neuroticism being confronted by environmental stressors leading to reaction of anxiety, changes in cardiovascular function and, in time, to coronary heart disease or mental ill health.

There are, therefore, two central features of stress at work, the interaction of which determines either coping or maladaptive behaviour and stress-related disease (Cooper & Marshall, 1975): (1) the dimensions or characteristics of the person and (2) the potential sources of stress in the work environment; or as Lofquist & Dawis (1969) have labelled this interaction The Person–Environment Fit. There is, however, a third set of extra-organizational variables which can also be sources of stress. These are not linked directly to the individual's characteristics or the work environment but are related to outside relationships and events, for example, family problems, financial

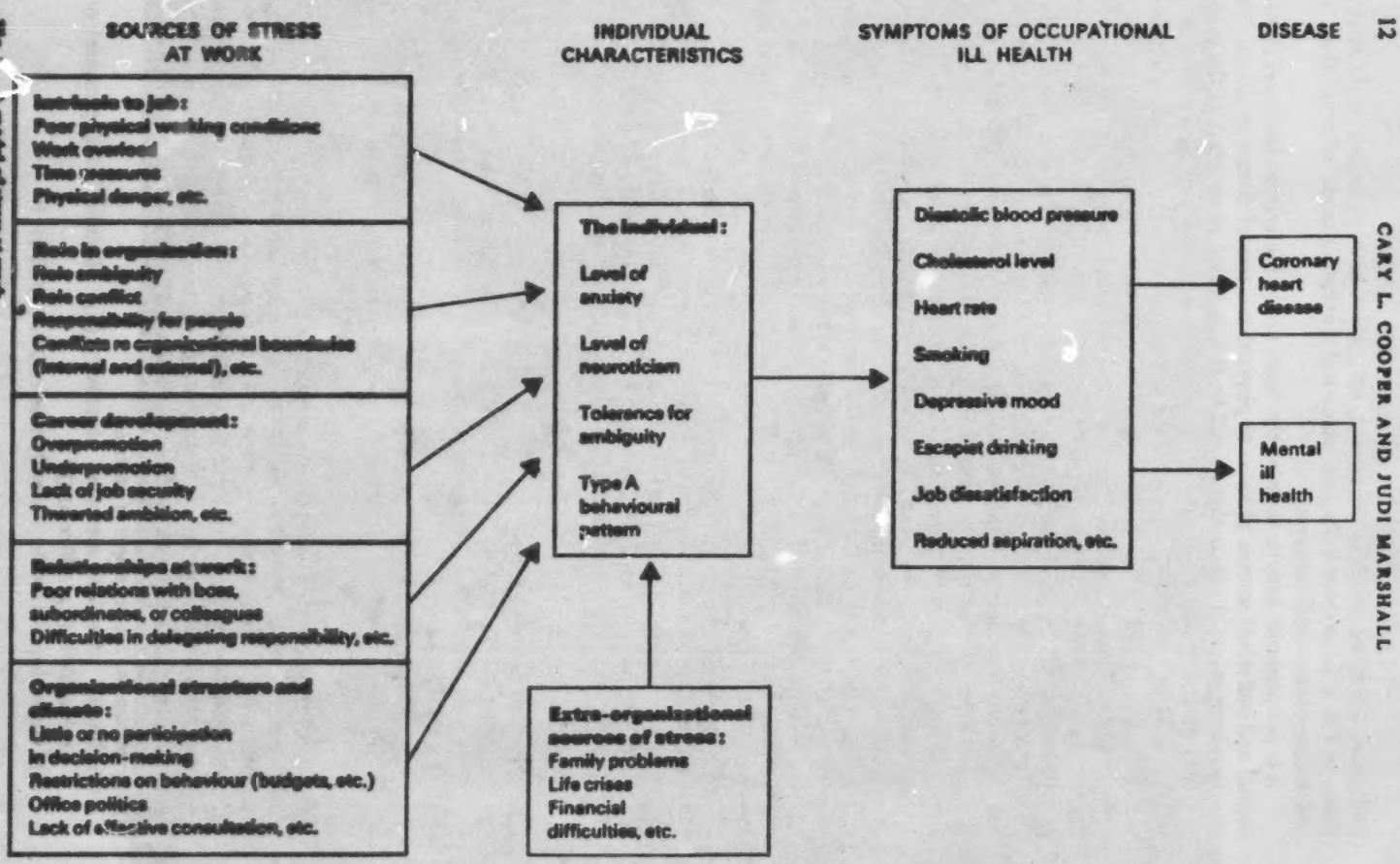

Fig. 1. A model of stress at work

difficulties, life crises (death in the family), etc., which have an impact in the workplace. In Fig. 1 we provide a diagram which will highlight a model of stress at work which incorporates these concepts.

It is our intention here to examine the stress research literature linking environmental and individual sources of stress to physical and mental disease or illness. We are attempting this in the hope that we will be able to reveal where much of the work has been done and where the gaps lie. In addition, since much of the research has been carried out 'within' particular disciplines (i.e. psychology, management, sociology, medicine) and *not* 'between' disciplines, it is hoped that we may indicate the potential of interdisciplinary work in this field and begin to encourage this development.

Before embarking on this review, it might be helpful to note that many of the stress studies over the last 10–15 years have utilized two primary indices of occupational disease, coronary heart disease (CHD) and mental ill health (MIH). A more limited number of studies have focused on other physical illnesses thought to be stress-related, such as peptic ulcers, respiratory diseases and allergies, but these have not been as thoroughly researched in respect to social and psychologic stressors as heart disease or mental ill health. We have concentrated on the CHD and MIH studies primarily but have included the others, where they have contributed a new dimension or perspective to this topic. It might be added here that our literature review covered all the journals incorporated in the MEDLARS literature-retrieval system of the US National Library of Medicine, which includes most of the relevant medical and social science journals.

We should like to preface this review with a brief summary of some of the methodological problems encountered in some of the studies to follow. In the main text detailed criticism of individual studies has been kept to a minimum to allow breadth of coverage; we hope here, however, to forewarn the reader of the difficulties of interpretation of the research reported. Some of the methodological shortcomings are:

(1) *Use of correlational analysis*
   (a) Most of the studies reported rely heavily on correlational data for their conclusions. The inferences about causality which can be drawn are, therefore, limited.
   (b) Correlational analysis also fails to point out the role of intervening variables. A causal chain is not necessarily only two variables long as many studies would have us believe.

(2) *Confusion of dependent and independent variables*
   By using the term 'stress' too widely—to denote pressure on the individual (e.g. work overload), its' effects (e.g. poor work performance), and also his reactions (e.g. escapist drinking)—researchers have contributed to conceptual and definitional confusion in this area. For an attempt to remedy this see Kagan & Levi (1974) and their 'theoretical model for psychosocially mediated disease'.

(3) *Definition and measurement of variables*
   (a) Should 'stress' be measured objectively (e.g. diastolic blood pressure) or subjectively (e.g. self-report)?
   (b) How adequate are the currently used measures of MIH?

(c) Some independent variables are susceptible to contamination by the dependent variable being studied. In retrospective studies of CHD deaths, for example, occupation (usually taken from the death certificate) may have been directly affected by a preceding illness.
(d) Use of broad categories (e.g. occupational levels) can obscure meaningful differences between groups and make the comparison of findings between studies more difficult.

(4) *Samples*
(a) Some researchers attempt to generalize from an intensive study of a small highly specific sample; others, from large-scale samples using simplistic survey techniques.
(b) It is difficult to decide what represents an adequate control group: the general normative population; patients suffering from (supposedly) *non* stress-related diseases; or the subjects at a 'normal' time in their lives?

(5) *Retrospective studies*
Retrospective studies are particularly likely to suffer from the drawbacks mentioned above; the current trend towards *prospective* studies is, therefore, encouraging.

ENVIRONMENTAL STRESSORS AT WORK

There are a large number of possible environmental sources of stress at work, as one can see from Fig. 1: factors intrinsic to a particular job (e.g. air traffic controller), role in organization, career development, relationships at work, and just 'being' in an organization:

Factors intrinsic to a job

A great deal of work has been done linking the working conditions of a particular job and its relationship to physical/mental health. Kornhauser (1965) found, for example, that poor mental health was directly related to unpleasant work conditions, the necessity to work fast and to expend a lot of physical effort, and to excessive and inconvenient hours. There is increasing evidence (Marcson, 1970; Shepard, 1971), that physical health, as well, is adversely affected by repetitive and dehumanizing environments (e.g. paced assembly lines). Kritsikis, Heinemann & Eitner (1968), for example, in a study of 150 men with angina pectoris in a population of over 4000 industrial workers in Berlin, reported that more of these workers came from work environments employing conveyor-line systems than any other work technology. Although we possess enough indirect data to suggest that paced assembly lines are a potential danger to occupational health (both mental and physical) not enough controlled work, with multiple health criteria measures, is available to draw any firm conclusions—research in this area is desperately needed.

On the other hand, research into work and overload has been given substantial empirical attention. French & Caplan (1973) have differentiated overload in terms of *quantitative* and *qualitative* overload. Quantitative refers to having 'too much to do', while qualitative means work that is 'too difficult'. (The complementary phenomena of quantitative and qualitative underload are also hypothesized as potential sources of stress but with little or no supportive research evidence.) Miller (1960) has theorized, and Terryberry (1968) has found, that 'overload' in most systems leads to breakdown,

whether we are dealing with single biological cells or individuals in organizations. In an early study, French & Caplan (1970) found that objective quantitative overload was strongly linked to cigarette smoking (an important risk factor or symptom of CHD). Persons with more phone calls, office visits, and meetings per given unit of work time were found to smoke significantly more cigarettes than persons with fewer such engagements. In a study of 100 young coronary patients, Russek & Zohman (1958) found that 25 per cent had been working at two jobs and an additional 45 per cent had worked at jobs which required (due to work overload) 60 or more hours per week. They add that although prolonged emotional strain preceded the attack in 91 per cent of the cases, similar stress was only observed in 20 per cent of the controls.

Breslow & Buell (1960) have also reported findings which support a relationship between hours of work and death from coronary disease. In an investigation of mortality rates of men in California, they observed that workers in light industry under the age of 45, who are on the job more than 48 hours a week, have twice the risk of death from CHD compared with similar workers working 40 or under hours a week. Another substantial investigation on quantitative workload was carried out by Margolis *et al.* (1974) on a representative national sample of 1496 employed persons, 16 years of age or older. They found that overload was significantly related to a number of symptoms or indicators of stress: escapist drinking (r=0·06), absenteeism from work (r=0·06), low motivation to work (r=0·26), lowered self-esteem (r=0·10), and an absence of suggestions to employers (r=0·17). Although these coefficients are significant, they are very small indeed, contributing between less than 1 per cent to a maximum of 5 per cent of the variance. Quantitative overload is obviously a potential source of occupational stress, as other studies (Quinn, Seashore & Mangione, 1971; Porter & Lawler, 1965) also indicate, but on the evidence available it may not, by itself, be a main factor in occupational ill health.

There is also some evidence that (for some occupations) 'qualitative' overload is a source of stress. French, Tupper & Mueller (1965) looked at qualitative and quantitative work overload in a large university. They used questionnaires, interviews and medical examinations to obtain data on risk factors associated with CHD for 122 university administrators and professors. They found that one symptom of stress, low self-esteem, was related to work overload but that this was different for the two occupational groupings. Qualitative overload was not significantly linked to low self-esteem among the administrators but was significantly correlated for the professors. The greater the 'quality' of work expected of the professor the lower the self-esteem. They also found that qualitative and quantitative overload were correlated (r=0·25 and r=0·42 respectively) to achievement orientation. And more interestingly, in a follow up study, that achievement orientation correlated very strongly with serum uric acid (r=0·68) (Brooks & Mueller, 1966). Several other studies have reported an association of qualitative work overload with cholesterol level; a tax deadline for accountants (Friedman, Rosenman & Carroll, 1958), medical students performing a medical examination under observation (Dreyfuss & Czackes, 1959), etc.

French & Caplan (1973) summarize this research by suggesting that both qualitative and quantitative overload produce at least nine different symptoms of psychological and physical strain; job dissatisfaction, job tension, lower self-esteem, threat, embarrassment, high cholesterol levels, increased heart rate, skin resistance, and more smoking. In analysing these data, however, one cannot ignore the vital interactive relationship of the job and employee; objective work overload, for example,

should not be viewed in isolation but relative to the individual's capacities and personality. It should also be noted that since qualitative and quantitative work overload measures stem from perceptions of the subject, they may be influenced by the subject's personality predispositions (e.g. nAch people).

Role in organization

Another major source of occupational stress is associated with a person's role at work. A great deal of research in this area has concentrated on role ambiguity and role conflict, since the seminal investigations of the Survey Research Center of the University of Michigan which were reported in the classic book *Organizational Stress: Studies in Role Conflict and Ambiguity* (Kahn *et al.* 1964). Role ambiguity exists when an individual has inadequate information about his work role, that is, where there is *lack of clarity* about the work objectives associated with the role, about work colleagues' expectation of the work role and about the scope and responsibilities of the job. Kahn *et al.* (1964) found in their study that men who suffered from role ambiguity experienced lower job satisfaction ($r=-0{\cdot}32$), high job-related tension ($r=0{\cdot}51$), greater futility ($r=0{\cdot}41$), and lower self-confidence ($r=-0{\cdot}27$). French & Caplan (1970) found, at one of NASA's bases (Goddard Space Flight Center), in a sample of 205 volunteer engineers, scientists and administrators, that role ambiguity was significantly related to low job satisfaction ($r=0{\cdot}42$) and to feelings of job-related threat to one's mental and physical well-being ($r=0{\cdot}40$). This also related to indicators of physiological strain such as increased blood pressure and pulse rate. Margolis *et al.* (1974) also found a number of significant relationships between symptoms or indicators of physical and mental ill health with role ambiguity in their representative national sample ($n=1496$). The stress indicators related to role ambiguity were depressed mood ($r=0{\cdot}12$), lowered self-esteem ($r=0{\cdot}16$), life dissatisfaction ($r=0{\cdot}08$), job dissatisfaction ($r=0{\cdot}13$), low motivation to work ($r=0{\cdot}06$), and intention to leave job ($r=0{\cdot}07$). As one can see these are not very strong relationships (contributing at most 2·5 per cent of the variance), indicating that although 'lack of role clarity' may well be a potential stressor at work, on its own it may not be a substantial one.

Role conflict exists when an individual in a particular work role is torn by conflicting job demands or doing things he/she really does not want to do or does not think are part of the job specification. The most frequent manifestation of this is when a person is caught between two groups of people who demand different kinds of behaviour or expect that the job should entail different functions. Kahn *et al.* (1964) found that men who suffered more role conflict had lower job satisfaction and higher job-related tension. It is interesting to note that they also found that the greater the power or authority of the people 'sending' the conflicting role messages, the more job dissatisfaction produced by role conflict. This was related to physiological strain as well, as the Goddard study (French & Caplan, 1970) illustrates. They telemetered and recorded the heart rate of 22 men for a two-hour period while they were at work in their offices. They found that the mean heart rate for an individual was strongly related to his report of role conflict.

A larger and medically more sophisticated study by Shirom *et al.* (1973) found similar results. They collected data on 762 male kibbutz members aged 30 and above, drawn from 13 kibbutzim throughout Israel. They examined the relationships between CHD (myocardial infarction, angina pectoris, and coronary insufficiency), abnormal electrocardiographic readings, CHD risk factors (systolic blood pressure, pulse rate,

serum cholesterol levels, etc.) and potential sources of occupational stress (work overload, role ambiguity, role conflict, lack of physical activity). Their data were broken down by occupational groups: agricultural workers, factory groups, craftsmen, and white collar workers. It was found that there was a significant relationship (r=0·19) between role conflict and CHD (specifically, abnormal electrocardiographic readings), but for the white collar workers only. In fact, as we moved down the ladder from occupations requiring great physical exertions (e.g. agriculture) to least (e.g. white collar), the greater was the relationship between role ambiguity/conflict and abnormal electrocardiographic findings. Role conflict was also significantly related to an index of ponderosity (excessive weight for age and height). It was also found that as we go from occupations involving excessive physical activities to those with less such activity, CHD (myocardial infarction, angina pectoris, and coronary insufficiency) increased significantly. The inference drawn from this is that as we move more toward clerical, managerial and professional occupations we may be increasing the likelihood of occupational stress due to identity and other interpersonal dynamics and less to the physical conditions of work.

There are a number of studies which relate occupational level to CHD and MIH, of which Marks (1967) provides an excellent review. The majority of these studies support the proposition that risk of CHD rises with occupational level (Ryle & Russell, 1949; Breslow & Buell, 1960; McDonough, *et al.* 1965; Syme, Hyman & Enterline, 1964; Wardwell, Hyman & Bahnson, 1964). Substantial national analyses of both British and American mortality data lend support to these studies. Not all researchers, however, are in agreement. Pell & D'Alonzo (1958) in a highly self-consistent longitudinal study of Dupont employees found that incidence of myocardial infarction was inversely related to salary roll level. Stamler, Kjelisberg & Hall (1960) and Bainton & Peterson (1963) also came up with contradictory results. A further group of researchers have added confusion by finding no relationship between CHD and occupation; Berkson (1960) for blue versus white collar Negroes, Spain (1960) for Jewish salesmen versus other occupational groupings and Paul (1963) for different job levels at the Western Electric Co.

The gross nature of classifications used in these studies has contributed to the confusion of results, particularly as some researchers have concentrated on occupational levels and others on discrete occupational groupings. The trend is, now, to look in more detail at significant job components, as a way of explaining differential CHD rates. Several studies, for example, have tried to assess whether inactivity or increased intellectual and emotional job demands contribute most to the increased risk of CHD with occupational level. Whilst the high positive correlation of these two in actual job situations makes this debate somewhat 'academic' it would appear likely that the latter is of greater importance. Intuitively, the physical activity of a clerk is not likely to be substantially less than that of a managing director, yet his risk of developing CHD is. Two studies quoted by Marks also come to this conclusion: in the first, farm owners were found to be more susceptible to CHD than farm labourers despite comparable activity rates (McDonough *et al.* 1965), and in the second 'downtown' bus drivers (sedentary) and conductors (active) had higher CHD than their suburban counterparts (Morris, 1953).

Another important potential stressor associated with one's organizational role is 'responsibility for people'. One can differentiate here between 'responsibility for people' and 'responsibility for things' (equipment, budgets, etc.). Wardwell *et al.*

(1964) found that responsibility for people was significantly more likely to lead to CHD than responsibility for things. Increased responsibility for people frequently means that one has to spend more time interacting with others, attending meetings, working alone and, in consequence, as in the Goddard study (French & Caplan, 1970), more time in trying to meet deadline pressures and schedules. Pincherle (1972) also found this in a UK study of 2000 executives attending a medical centre for a medical check up. Of the 1200 managers sent by their companies for their annual examination, there was evidence of physical stress being linked to age and level of responsibility; the older and more responsible the executive, the greater the probability of the presence of CHD risk factors or symptoms.

Other research (Terhune, 1963) has also established this link. The relationship between age and stress-related illness could be explained, however, by the fact that as the executive gets older he may be troubled by stressors other than increased responsibility, for example, as Eaton (1969) suggests, by (1) a recognition that further advancement is unlikely, (2) increasing isolation and narrowing of interests and (3) an awareness of approaching retirement. Nevertheless, the finding by French & Caplan in the Goddard study does indicate that responsibility for people must play some part in the process of stress, particularly for clerical, managerial, and professional workers. They found that responsibility for people was significantly related to heavy smoking ($r=0{\cdot}31$), diastolic blood pressure ($r=0{\cdot}23$), and serum cholesterol levels (the index of non-linear association equalled 0·23)—the more the individual had responsibility for things as opposed to people the lower were each of these CHD risk factors. These findings seem provocative and provide a potentially fruitful line of further research, for example, the differential impact of these sources on blue and white collar workers.

Career development

A third set of environmental stressors is related to career development; this refers to the impact of overpromotion, underpromotion, status incongruence, lack of job security, thwarted ambition, etc. Brook (1973) provided four very interesting case studies of individuals showing behavioural disorders as a result of being either overpromoted (when a person has reached the peak of his abilities with little possibility of further development and is given responsibility exceeding his capacity) or underpromoted (not given responsibility commensurate with ability level). In each case the progression of the status disorder was from minor psychological symptoms (e.g. palpitations, episodes of panic, etc.) to marked psychosomatic complaints and then to mental illness. Taylor (1969) suggests that this 'career development' stress is rooted in Freudian theory which suggests that work has value solely as a utility for individualistic motives of 'getting on in the world' and the desires of fame and success. This was confirmed by Kleiner & Parker (1963), who proposed a general theory which linked frustrated work aspirations to mental disorder; and their results, from a later and larger study with urban Negroes (Parker & Kleiner, 1966), support their hypotheses.

Erikson & Gunderson of the US Navy Neuropsychiatric Unit are developing a comprehensive research programme in the US Navy to assess this problem systematically, which they term 'status congruence' or the matching of one individual's advancement with his experience ability. In an earlier study they found (Arthur & Gunderson, 1965) that promotional lag was significantly related to psychiatric illness. Later they found (Erikson, Pugh & Gunderson, 1972) that Navy personnel experience greater

job satisfaction when their rates of advancement exceeded (although not excessively) their expectation (*eta* coefficient between job satisfaction and status congruence was 0·085, $P < 0·01$); dissatisfaction increased as advancement rates were retarded. Those who were least successful with regard to advancement tended to perceive the greatest amount of stress in their lives. In a more recent study Erikson, Edwards & Gunderson (1973) found among a sample of over 9000 Navy ratings that (1) status congruency was negatively related to the incidence of psychiatric disorder (a one-way analysis of variance, fixed effects model, indicated differences between psychiatric in patients and out patients and controls, $F = 85·85$, d.f. = 2,9722, $P < 0·001$) and (2) that status congruency was positively related to military effectiveness ($r = 0·64$).

The issue of status congruency has also been researched from a sociological perspective, that is, the incongruity between an individual's social status and that of his parents or social class differences between his parents. Shekelle, Ostfeld & Paul (1969), for example, in a prospective study of a medically examined industrial population, discovered that men were at a significantly higher risk of CHD when their social class in childhood, or the wife's social class in her childhood, was higher or lower than the class level that they presently shared. Kasl & Cobb (1967) also found that parental status stress appears to be a variable having 'strong, long-term effects on physical and mental health of adult offspring'. Berry (1966) found among a 6131 national sample that a small amount of variance in morbidity rate (incidence of hospitalization) was explained by status inconsistency. Jackson (1962) reached a more differentiated conclusion about status incongruence 'that all forms of status inconsistency are psychologically disturbing, but response to stress varies with relative positions of inconsistent person's achieved and ascribed status ranks'. More and more evidence is growing that social status stress is a problem in Western, highly mobile society. As Wan (1971) summarizes, the rationale for stress induced by status inconsistency is that 'role conflict generated from incompatible expectations of a social position may yield psychological disturbances and frustrations which in turn form part of the stress–disease linkage'.

Relationships at work

Another major source of stress at work has to do with the nature of relationships with one's boss, subordinates and colleagues. A number of behavioural scientists (Argyris, 1964; Cooper, 1973) have suggested that good relationships between members of a work group are a central factor in individual and organizational health. Nevertheless very little research work has been done in this area to either support or disprove this hypothesis. French & Caplan (1973) define poor relations as 'those which include low trust, low supportiveness, and low interest in listening to and trying to deal with problems that confront the organizational member'. The most notable studies in this area are by Kahn *et al.* (1964), French & Caplan (1970), and Buck (1972). Both the Kahn *et al.* and French & Caplan studies came to roughly the same conclusion: that mistrust of persons one worked with was positively related to high role ambiguity, which led to inadequate communications between people and to 'psychological strain in the form of low job satisfaction and to feelings of job-related threat to one's well being'. It was interesting to note, however, in the Kahn *et al.* study that poor relations with one's subordinates was significantly related to feelings of threat with colleagues ($r = 0·44$) and superiors ($r = 0·41$) but not in relationship to threat with subordinates ($r = 0·12$ only).

Buck (1972) focused on the attitude and relationship of workers and managers to their immediate boss using Fleishman's leadership questionnaire on consideration and initiating structure. The consideration factor was associated with behaviour indicative of friendship, mutual trust, respect and a certain warmth between boss and subordinate. He found that those workers who felt that their boss was low on 'consideration' reported feeling more job pressure. Workers who were under pressure reported that their boss did not give them criticism in a helpful way, played favourites with subordinates, and ' "pulled rank" and took advantage of them whenever they got a chance'. Buck concludes that the 'considerate behaviour of supervisors appears to have contributed significantly to feelings of job pressure'.

Most of the studies exploring the nature of work relationships and their impact on job stress have been investigated by social psychologists [as illustrated by the French & Caplan (1970) and Buck (1972) studies above], using attitudinal measures of job satisfaction and pressure. Very little empirical work is available on the medical side, on how this particular stressor may contribute to physical and mental ill health. Although there are some social psychological studies available there is a glaring need for research in this area.

Organizational structure and climate

A fifth potential source of organizational stress is 'being in the organization', which means those aspects of the structure of an organization which can make working life either satisfactory or stressful; such as little or no participation in the decision-making process, lack of effective consultation, restrictions on behaviour (e.g. budgets), office politics, etc. An increasing number of research investigations are being conducted in this area, particularly into the effect of employee participation in the workplace. This research development is contemporaneous with a growing movement, in North America and in the EEC countries, toward worker participation programmes, involving autonomous work groups, worker-directors, and a greater sharing of the decision-making process throughout the organization.

The early work on participation was in terms of its effect on production and attitudes of workers. For example, Coch & French (1948) examined three degrees of participation in a sewing factory. They found the greater the participation the higher was the productivity, the greater the job satisfaction, the lower the turnover and the better were the relationships between boss and subordinate. These findings were later supported by a field experiment in a footwear factory in Southern Norway where greater participation led to significantly more favourable attitudes by workers toward management and more involvement in their job (French, Israel & As, 1960). There are many other research examples of the effect of participation on work-related criteria measures and the diagram in Fig. 2 summarizes some of these findings.

The research more relevant to our interests here, however, is the recent work on lack of participation and stress-related disease. In the Goddard study (French & Caplan, 1970), for example, they found that people who reported greater opportunities for participation in decision-making reported significantly greater job satisfaction ($r=0{\cdot}50$), low job-related feelings of threat ($r=0{\cdot}51$), and higher feelings of self-esteem ($r=0{\cdot}32$). Buck (1972) found that both managers and workers, who felt 'under pressure' most, reported that their supervisors 'always ruled with an iron hand and rarely tried out new ideas or allowed participation in decision-making'. Managers who were under stress also reported that their supervisors never let the persons under

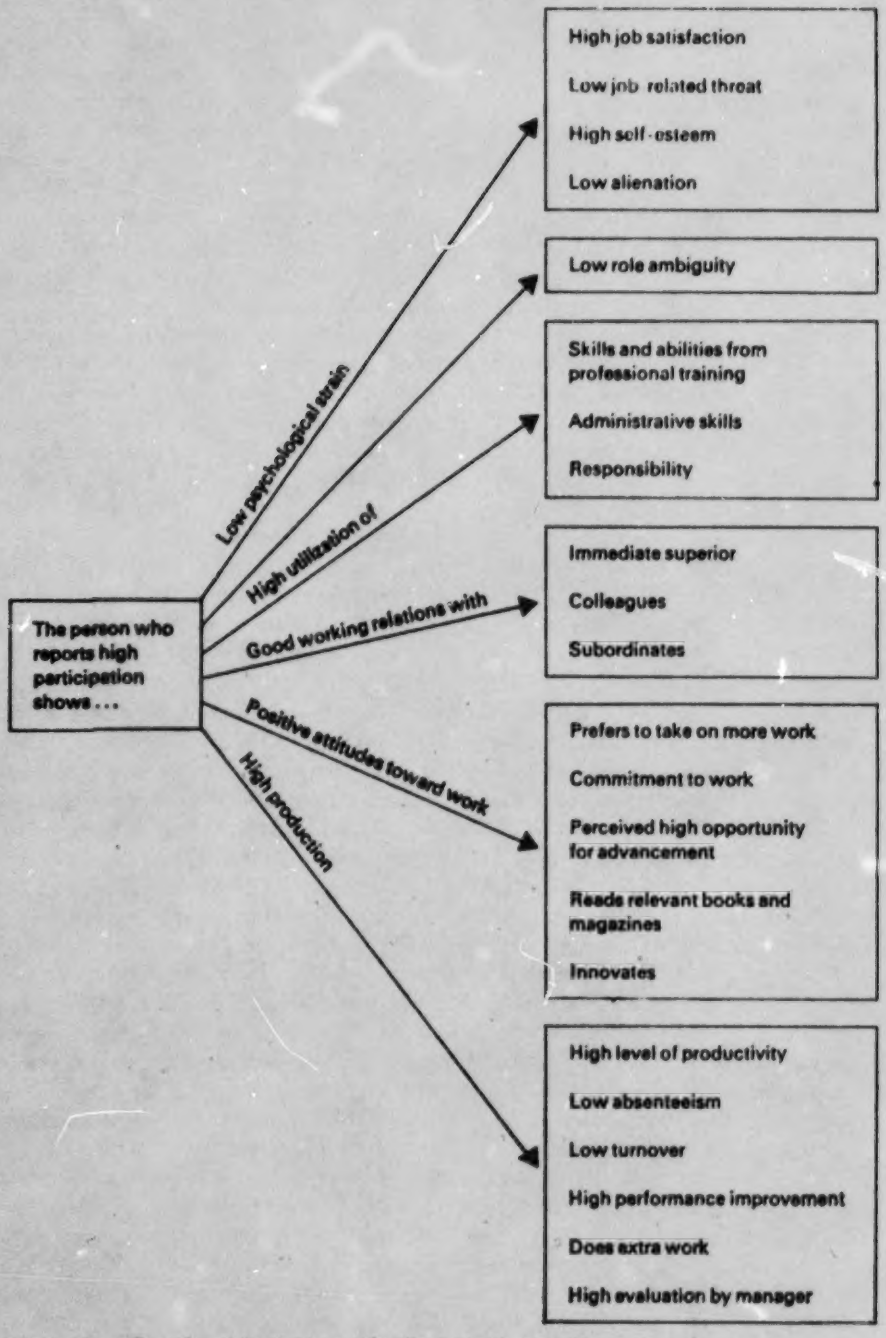

Fig. 2. The effect of participation on work-related criteria measures.
Source: French, J. R. P. & Caplan, R. D. (1973). Organizational stress and individual strain. In A. J. Marrow (ed.), *The Failure of Success*. New York: AMACOM, p.52.

them do their work in the way they thought best. Margolis *et al.* (1974) found that non-participation at work, among a national representative sample of over 1400 workers, was the most consistent and significant predictor or indicator of strain and job-related stress. They found that non-participation was significantly related to the following health risk factors: overall poor physical health (r -0·08), escapist drinking (r=0·06), depressed mood (r=0·21), low self-esteem (r=0·29), low life satisfaction (r=0·23), low job satisfaction (r=0·34), low motivation to work (r=0·48), intention to leave job (r=0·22) and absenteeism from work (r=0·11). It is interesting to note that the larger correlations were with psychological variables (e.g. motivation, self-esteem, life satisfaction, etc.). Kasl (1973) also found that low job satisfaction was related to non-participation in decision-making, inability to provide feedback to supervisors and lack of recognition for good performance; and that poor mental health was linked to close supervision and no autonomy at work (Quinn *et al.* 1971). Neff (1968) has highlighted the importance of lack of participation and involvement by suggesting that 'mental health at work is to a large extent a function of the degree to which output is under the control of the individual worker'.

To summarize, the research above seems to indicate that greater participation leads to lower staff turnover, higher productivity, high performance improvements (French & Caplan, 1973); and that when participation is absent, lower job satisfaction and higher levels of physical and mental health risks result: One must, however, be very cautious about reaching definitive conclusions from these investigations since they are, on balance, correlational studies and the inferences one can draw on causality are limited. More empirical work is necessary in this area, therefore, if we are comprehensively and accurately to assess the impact of the future substantial developments in improving the quality of working life.

Extra-organizational sources of stress

Needless to say there are a number of extra-organizational sources of stress which affect the physical and mental well-being of an individual at work, such things as family problems (Pahl & Pahl, 1971), life satisfaction and crises (Dohrenwend & Dohrenwend, 1974), financial difficulties, etc. These are important potential stressors since they act in a feedback loop between work and the outside environment: problems outside work→affect→individual at work→exacerbate→problems outside work.

Not very much research work has been done into some of the more important extra-organizational factors, particularly the relationship between family and work life. Gowler & Legge (1975) refer to this latter as the 'hidden contract' and suggest that 'although the relationship between occupational/productive and domestic/consumer activities may be agreed in general terms, stresses may arise over the allocation of resources, in particular, of time and commitment to these two areas'. The recent work by Rapoport & Rapoport (1971) as well, on the psychological and social consequences of dual career families, augurs well for an increasing research focus on these important 'outside work' sources of stress. Suffice it to say that research inquiry is needed here both to identify these stressors and to assess their degree of influence in stress-related disease.

INDIVIDUAL DIFFERENCES IN COPING WITH STRESS

Sources of pressure at work evoke different reactions from different people. Some people are better able to cope with these stressors than others, they adapt their

behaviour in a way that meets the environmental challenge. On the other hand some people are more characterologically predisposed to stress, that is, they are unable to cope or adapt to the stress-provoking situation. A great deal of research has been done on the individual differences associated with stress-related diseases, particularly CHD. There have been two principal directions of research in this area: one has concentrated on examining the relationship between various psychometric measures (primarily using the MMPI and 16PF) and stress-related disease (primarily CHD); and the other on stress- or coronary-prone behaviour patterns and the incidence of disease.

Jenkins (1971*a*,*b*) provides an extensive review of these studies. In the first category, there were six studies which utilized the MMPI. The result of these six studies (Bakker & Levenson, 1967; Ostfeld, Lebovits & Shekelle, 1964; Lebovits, Shekelle & Ostfeld, 1967; Brozek, Keys & Blackburn, 1966; Bruhn, Chandler & Wolf, 1969; Mordkoff & Rand, 1968) seems to be that before their illness patients with coronary disease differ from persons who remain healthy on several MMPI scales, particularly those in the 'neurotic' triad of hypochondriasis (Hs), depression (D), and hysteria (Hy). The occurrence of manifest CHD increases the deviation of patients' MMPI scores further and, in addition, there is ego defence breakdown. As Jenkins (1971*a*, p.251) summarizes 'patients with fatal disease tend to show greater neuroticism (particularly depression) in prospective MMPI's than those who incur and survive coronary disease'. There are three major studies utilizing the 16PF (Bakker, 1967; Finn, Hickey & O'Doherty, 1969; Lebovits *et al.* 1967). All three of these report emotional instability (low Scale C), particularly for patients with angina pectoris. Two studies report high conformity and submissiveness (Factor E) and desurgency/seriousness (Factor F), and two report high self-sufficiency (Factor Q2). Bakker's angina patients are similar to Finn's sample with CHD, in manifesting shyness (Factor H) and apprehensiveness (Factor O). The results from all three studies portray the patients with CHD or related illness as emotionally unstable and introverted, which is consistent with the six MMPI studies. The limitation of these studies is that they are, on balance, retrospective. That is, that anxiety and neuroticism may well be reactions to CHD and other stress-related illnesses rather than precursors of it. Paffenbarger, Wolf & Notkin (1966) did an interesting prospective study, in which they linked university psychometric data on students with death certificates filed years later. They found a number of significant precursors to fatal CHD, one of which was a high anxiety/neuroticism score for the fatal cases.

The other research approach to individual stress differences began with the work of Friedman & Rosenman (Friedman, 1969; Rosenman, Friedman & Strauss, 1964, 1966) in the early sixties and developed later showing a relationship between behavioural patterns and the prevalence of CHD. They found that individuals manifesting certain behavioural traits were significantly more at risk to CHD. These individuals were later referred to as the 'coronary-prone behaviour pattern Type A' as distinct from Type B (low risk to CHD). Type A was found to be the overt behavioural syndrome or style of living characterized by 'extremes of competitiveness, striving for achievement, aggressiveness, haste, impatience, restlessness, hyperalertness, explosiveness of speech, tenseness of facial musculature and feelings of being under pressure of time and under the challenge of responsibility'. It was suggested that 'people having this particular behavioural pattern were often so deeply involved and committed to their work that other aspects of their lives were relatively neglected' (Jenkins, 1971*b*).

In the early studies, persons were designated as Type A or Type B on the basis of clinical judgements of doctors and psychologists or peer ratings. These studies found higher incidence of CHD among Type A than Type B.

Many of the inherent methodological weaknesses of this approach were overcome by the classic Western Collaborative Group Study (Rosenman *et al.* 1964, 1966). It was a prospective (as opposed to the earlier retrospective studies) national sample of over 3400 men free of CHD. All these men were rated Type A or B by psychiatrists after intensive interviews, without knowledge of any biological data about them and without the individuals being seen by a cardiologist. Diagnosis was made by an electrocardiographer and independent medical internist, who were not informed about the subjects' behavioural patterns. They found the following results; after 2½ years of the start of the study, Type A men between the ages of 39–49 and 50–59, had 6·5 and 1·9 times respectively the incidence of CHD than Type B men. They also had the following risk factors of elevated serum cholesterol levels, elevated beta-lipoproteins, decreased blood clotting time, and elevated daytime excretion of norepinephrine. After 4½ years of the follow-up observation in the study, the *same* relationship of behavioural pattern and incidence of CHD was found. In terms of the clinical manifestations of CHD, individuals exhibiting Type A behavioural patterns had significantly more incidence of acute myocardial infarction (and of clinically unrecognized myocardial infarction) and angina pectoris. Rosenman, Friedman & Jenkins (1967) also found that the risk of recurrent and fatal myocardial infarction was significantly related to Type A characteristics.

Quinlan and his colleagues (Quinlan, Barrow & Hayes, 1969) found the same results among Trappist and Benedictine monks. Monks judged to be Type A coronary-prone cases (by a double-blind procedure) had 2·3 times the prevalence of angina and 4·3 times the prevalence of infarction as compared to monks judged Type B. Many other studies (Bortner & Rosenman, 1967; Zyzanski & Jenkins, 1970) have been conducted with roughly the same findings.

French & Caplan (1970) conclude their review of this evidence by saying 'such wealth of findings makes it hard to ignore Type A as a relevant syndrome'. It can be seen therefore that psychometric and behavioural data on individual differences play a crucial role in the Person–Environment Fit paradigm and ultimately in the manifestation of stress-related disease.

CONCLUSIONS

A great deal of research work is required in the field of occupational stress if we are to begin to understand the multifaceted nature of the problem. The preceding research indicates glaring gaps, partially filled crevices, and in the odd case some thoughtful, purposive, and well-planned work. The gaps lie not only in certain areas (as discussed in the text) associated with particular sources of stress (for instance, the impact of poor relationships at work, involvement and participation in the job, over and underpromotion, and most of the extra-organizational sources of stress), but also in our lack of ability to see this field of work as essentially interdisciplinary, requiring a number of resources from a variety of disciplines. In addition, the area of stress is essentially multifactorial, requiring that we focus on more than one stressor at a time, if we are to draw meaningful conclusions from our data. The research challenge in this field, therefore, will be in widening our boundaries, in terms of working with other disciplines and trying to avoid thinking about problems from a single causative perspective.

Despite some of the methodological weaknesses and the large gaps in our knowledge, the extensive research reviewed here provides seminal evidence to support the notion that the work environment and modern organizations have an impact on the physical and mental health of their members. As French & Caplan (1973) suggest 'many of the stresses which are fairly prevalent in national samples and in specific organizational settings appear to be linked in one way or another with strains which produce CHD. But, the fact that CHD seems to be as much a part of organizational life as does other traits of organizations, such as size and structure, does not mean that steps cannot be taken to reduce the risk of disease'. There are many innovative and pioneering research and change programmes which psychologists, management, and industrial medical officers can introduce which could alter the quality of working life and minimize the sources of occupational ill health. The need is greatest in areas associated with the environmental and social conditions in many manufacturing technology work sites (e.g. paced assembly lines, continuous processing systems, etc.), in understanding and meeting individual and interpersonal needs in the work group, in greater involvement and participation of workers (including white collar and managerial) in the process of work group and company-wide decision-making, in exploring the impact of the work culture on family life, etc. There are a number of changes that can be introduced in industrial life to begin to cope with these challenges:

(1) Restructuring the social and technological environment in the workplace to encourage greater autonomy and participation by people in *their* jobs. This does not mean that we should continue to encourage tinkering with small-scale job enrichment schemes, but rather we should concern ourselves with more fundamental structural changes in organizations to accommodate this development.

(2) Bridging the gap between the workplace and the home; providing opportunities for the employee's wife to understand better her husband's job and to express her views about the consequences of his work on family life.

(3) Building on the well-developed catalogue of social and interactive skill training programmes to help clarify role and interpersonal relationship difficulties within organizations. Many of these techniques have been used in individual-oriented skill development training, but they have enormous untapped potential for use 'within' organizations in dealing with some of the sources of stress at work.

If we can get organizations, social scientists and doctors to work together on these sorts of problems (in the field), we may be able to make important contributions not only to the social, managerial, and medical sciences but to the physical and mental well-being of men and women at work.

REFERENCES

Aldridge, J. F. L. (1970). Emotional illness and the working environment. *Ergonomics* 13 (5), 613–621.

Argyris, C. (1964). *Integrating the Individual and the Organization*. New York: Wiley.

Arthur, R. J. & Gunderson, E. K. (1965). Promotion and mental illness in the Navy. *J. occup. Med.* 7, 452–456.

Bainton, C. R. & Peterson, D. R. (1963). Deaths from coronary heart disease in persons fifty years of age and younger: A community-wide study. *New Eng. J. Med.* 268, 569–574.

Bakker, C. B. (1967). Psychological factors in angina pectoris. *Psychosomatics* 8, 43–49.

Bakker, C. B. & Levenson, R. M. (1967). Determinants of angina pectoris. *Psychosom. Med.* 29, 621–633.

Berkson, D. (1960). Socioeconomic correlates of atherosclerotic and hypertensive heart disease, in culture, society and health. *Ann. N.Y. Acad. Sci.* 84, 835–850.

Berry, K. J. (1966). Status integration and morbidity. Unpublished PhD thesis, University of Oregon.
Bortner, R. W. & Rosenman, R. H. (1967). The measurement of pattern A behavior. *J. chron. Dis.* 20, 525–533.
Breslow, L. & Buell, P. (1960). Mortality from coronary heart disease and physical activity of work in California. *J. chron. Dis.* 11, 615–626.
Brook, A. (1973). Mental stress at work. *The Practitioner*, 210, 500–506.
Brooks, G. W. & Mueller, E. F. (1966). Serum urate concentrations among university professors. *J. Am. med. Assoc.* 195, 415–418.
Brozek, J., Keys, A. & Blackburn, H. (1966). Personality differences between potential coronary and non-coronary patients. *Ann. N.Y. Acad. Sci.* 134, 1057–1064.
Bruhn, J. G., Chandler, B. & Wolf, S. (1969). A psychological study of survivors and nonsurvivors of myocardial infarction. *Psychosom. Med.* 31, 8–19.
Buck, V. (1972). *Working Under Pressure*. London: Staples.
Coch, L. & French, J. R. P. (1948). Overcoming resistance to change. *Hum. Relat.* 11, 512–532.
Cooper, C. L. (1973). *Group Training for Individual and Organizational Development*. Basel, Switzerland: S. Karger.
Cooper, C. L. & Marshall, J. (1975). The management of stress. *Personn. Rev.* 4, 27–31.
Department of Health & Social Security. (1969). *Annual Report for 1968*. London: HMSO.
Dohrenwend, B. S. & Dohrenwend, B. P. (1974). *Stressful Life Events*. New York: Wiley.
Dreyfuss, F. & Czackes, J. W. (1959). Blood cholesterol and uric acid of healthy medical students under stress of examination. *Archs Int. Med.* 103, 708.
Eaton, M. T. (1968). The mental health of the older executive. *Geriatrics* 24, 126–134.
Erikson, J., Edwards, D. & Gunderson, E. K. (1973). Status congruency and mental health. *Psychol. Rep.* 33, 395–401.
Erikson, J., Pugh, W. M. & Gunderson, E. K. (1972). Status congruency as a predictor of job satisfaction and life stress. *J. appl. Psychol.* 56, 523–525.
Felton, J. S. & Cole, R. (1963). The high cost of heart disease. *Circulation* 27, 957–962.
Finn, F., Hickey, N. & O'Doherty, E. F. (1969). The psychological profiles of male and female patients with CHD. *Irish J. med. Sci.* 2, 339–341.
French, J. R. P. & Caplan, R. D. (1970). Psychosocial factors in coronary heart disease. *Indust. Med.* 39, 383–397.
French, J. R. P. & Caplan, R. D. (1973). Organizational stress and individual strain. In A. J. Marrow (ed.), *The Failure of Success*. New York: AMACOM, pp.30–66.
French, J. R. P., Israel, J. & As, D. (1960). An experiment in participation in a Norwegian factory. *Hum. Relat.* 13 (1), 3–20.
French, J. R. P., Tupper, C. J. & Mueller, E. I. (1965). Workload of university professors. Unpublished research report, Ann Arbor, Mich.: University of Michigan.
Friedman, M. (1969). *Pathogenesis of Coronary Artery Disease*. New York: McGraw-Hill.
Friedman, M., Rosenman, R. H. & Carroll, V. (1958). Changes in serum cholesterol and blood clotting time in men subjected to cyclic variations of occupational stress. *Circulation* 17, 852–861.
Gowler, D. & Legge, K. (1975). *Managerial Stress*. London: Gower Press.
Jackson, E. F. (1962). Status consistency and symptoms of stress. *Am. soc. Rev.* 28, 469–480.
Jenkins, C. D. (1971*a*). Psychologic and social precursors of coronary disease. *New Eng. J. Med.* 284 (5), 244–255.
Jenkins, C. D. (1971*b*). Psychologic and social precursors of coronary disease. *New Eng. J. Med.* 284 (6), 361–317.
Kagan, A. R. & Levi, L. (1974). Health and environment-psychosocial stimuli: a review. *Soc. Sci. Med.* 8, 225–241.
Kahn, R. L., Wolfe, D. M., Quinn, R. P., Snoek, J. D. & Rosenthal, R. A. (1964). *Organizational Stress*. New York: Wiley.
Kahn, R. L. & Quinn, R. P. (1970). Role stress. In McLean (ed.), *Mental Health and Work Organization*, Chicago: Rank McNally, pp.50–115.
Kasl, S. V. (1973). Mental health and the work environment. *J. occup. Med.* 15 (6), 509–518.
Kasl, S. V. & Cobb, S. (1967). Effects of parental status incongruence and discrepancy in physical and mental health of adult offspring. *J. Person. soc. Psychol., Monograph* 7, Whole no. 642, 1–15.
Klineberg, R. J. & Parker, S. (1963). Goal striving, social status, and mental disorder. *Am. soc. Rev.* 28, 189–203.

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KORNHAUSER, A. (1965). *Mental Health of the Industrial Worker*. New York: Wiley.

KRITSIKIS, S. P., HEINEMANN, A. L. & EITNER, S. (1968). Die Angina Pectoris im Aspekt ihrer Korrelation mit biologischer Disposition, psychologischen und soziologischen Emflussfaktoren. *Deutsch Gesundheit* 23, 1878–1885.

LEBOVITS, B. Z., SHEKELLE, R. B. & OSTFELD, A. M. (1967). Prospective and retrospective studies of CHD. *Psychosom. Med.* 29, 265–272.

LOFQUIST, L. H. & DAWIS, R. V. (1969). *Adjustment of Work*. New York: Appleton-Century-Crofts.

MCDONOUGH, J. R., HAMES, C. G., STULB, S. C. & GARRISON, G. E. (1965). Coronary heart disease among Negroes and Whites in Evans County, Georgia. *J. chron. Dis.* 18, 443–468.

MARCION, S. (1970). *Automation, Alienation and Anomie*. New York: Harper & Row.

MARGOLIS, B. L., KROES, W. H. & QUINN, R. P. (1974). Job stress: an unlisted occupational hazard. *J. occup. Med.* 16 (10), 654–661.

MARKS, R. U. (1967). Social stress and cardiovascular disease. *The Millbank Memorial Fund Q.* XLV, no. 2, 51–107.

MILLER, J. G. (1960). Information input overload and psychopathology. *Am. J. Psychiat.* 8, 116.

MORDKOFF, A. M. & RAND, M. A. (1968). Personality and adaptation to coronary artery disease. *J. consult. clin. Psychol.* 32, 648–653.

MORRIS, J. N. (1953). Coronary heart disease and physical activity at work: I Coronary heart disease in different occupations. *The Lancet* 2, 1053–1057.

MORRIS, J. N. *et al.* (1953). Coronary heart disease and physical activity of work: II Statement and testing of provisional hypothesis. *The Lancet* 2, 1111–1120.

NEFF, W. S. (1968). *Work and Human Behavior*. New York: Atherton Press.

OSTFELD, A. M., LEBOVITS, B. Z. & SHEKELLE, R. B. (1964). A prospective study of the relationship between personality and CHD. *J. chron. Dis.* 17, 265–276.

PAFFENBARGER, R. S., WOLF, P. A. & NOTKIN, J. (1966). Chronic disease in former college students. *Am. J. Epidemol.* 83, 314–328.

PAHL, J. M. & PAHL, R. E. (1971). *Managers and their Wives*. London: Allen Lane.

PARKER, S. & KLEINER, R. J. (1966). *Mental Illness in the Urban Negro Community*. New York: The Free Press.

PAUL, O. (1963). A longitudinal study of coronary heart disease. *Circulation* 28, 20–31.

PELL, S. & D'ALONZO, C. A. (1958). Myocardial infarction in a one year industrial study. *J. Am. med. Assoc.* 166, 332–337.

PINCHERLE, G. (1972). Fitness for work. *Proc. R. Soc. Med.* 65 (4), 321–324.

PORTER, L. W. & LAWLER, E. E. (1965). Properties of organization structure in relation to job attitudes and job behavior. *Psychol. Bull.* 64, 23–51.

QUINLAN, C. B., BURROW, J. G. & HAYES, C. G. (1969). The association of risk factors and CHD in Trappist and Benedictine monks. Paper presented to the American Heart Association, New Orleans, Louisiana.

QUINN, R. P., SEASHORE, S. & MANGIONE, I. (1971). *Survey of Working Conditions*. Washington, DC: US Government Printing Office.

RAPOPORT, R. & RAPOPORT, R. (1971). *Dual-Career Families*. London: Penguin.

ROSENMAN, R. H., FRIEDMAN, M. & JENKINS, C. D. (1967). Clinically unrecognized myocardial infarction in the Western Collaborative Group Study. *Am. J. Cardiol.* 19, 776–782.

ROSENMAN, R. H., FRIEDMAN, M. & STRAUSS, R. (1964). A predictive study of CHD. *J. Am. med. Assoc.* 189, 15–22.

ROSENMAN, R. H., FRIEDMAN, M. & STRAUSS, R. (1966). CHD in the Western Collaborative Group Study. *J. Am. med. Assoc.* 195, 86–92.

RUSSEK, H. I. & ZOHMAN, B. L. (1958). Relative significance of hereditary diet, and occupational stress in CHD of young adults. *Am. J. med. Sci.* 235, 266–275.

RYLE, J. A. & RUSSELL, W. T. (1949). The natural history of coronary disease: A clinical and epidemiological study. *Br. Heart J.* 11, 370–389.

SHEKELLE, R. B., OSTFELD, A. M. & PAUL, O. (1969). Social status and incidence of CHD. *J. chron. Dis.* 22, 381–394.

SHEPARD, J. M. (1971). *Automation and Alienation*. Cambridge, Mass.: MIT Press.

SHIROM, A., EDEN, D., SILBERWASSER, S. & KELLERMAN, J. J. (1973). Job stresses and risk factors in coronary heart disease among occupational categories in kibbutzim. *Soc. Sci. Med.* 7, 875–892.

SPAIN, D. M. (1960). Problems in the study of coronary atherosclerosis in population groups, in Culture, Society & Health. *Ann. N.Y. Acad. Sci.* 84, 816–834.

STAMLER, J., KJELSBERG, M. & HALL, Y. (1960). Epidemiologic studies of cardiovascular-renal diseases: I Analysis of mortality by age—race—sex—occupation. *J. chron. Dis.* 12, 440–455.

SYME, S. L., HYMAN, M. M. & ENTERLINE, P. E. (1964). Some social and cultural factors associated with the occurrence of coronary heart disease. *J. chron. Dis.* 17, 277–289.

TAYLOR, G. C. (1969). Executive stress. *Int. clin. Psychiat.* 6 (4), 307–316.

TERHUNE, W. B. (1963). Emotional problems of executives in time. *Indus. med. Surg.* 32, 1–67.

TERVERRAY, S. (1968). The organization of environments. Unpublished PhD thesis, Ann Arbor, Mich.: University Microfilms.

WAN, T. (1971). Status stress and morbidity: a sociological investigation of selected categories of work-limiting chronic conditions. *J. chron. Dis.* 24, 433–468.

WARDWELL, W. I., HYMAN, M. M. & BAHNSON, C. B. (1964). Stress and coronary disease in three field studies. *J. chron. Dis.* 17, 73–84.

ZYZANSKI, S. J. & JENKINS, C. D. (1970). Basic dimension within the coronary-prone behavior pattern. *J. chron. Dis.* 22, 781–795.

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A REVIEW OF NIOSH PSYCHOLOGICAL STRESS RESEARCH--1977

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This paper describes some current National Institute for Occupational Safety and Health (NIOSH) stress research studies and their results to date. The studies to be discussed have been selected for their representativeness of current NIOSH occupational stress research.

STRESS EPIDEMIOLOGY

Under a contract with the Tennessee Department of Mental Health and Mental Retardation, over 22,000 health records of workers in 130 occupations have been collected, coded and processed for future evaluation. NIOSH research staff have made some evaluations of these health records and have made determinations of incidence of stress-related diseases for each of the 130 occupations studied. The health records were taken from three different sources--death certificates, hospital admissions and mental health center admissions. Evaluations were made for the mental health center admissions separately and for all three data sources combined.

Stress-Related Disease Incidence by Occupation

Data concerning illnesses potentially involving psychogenic factors in their etiology were collected from all three data sources for the years January, 1972 through June, 1974. The major disease processes examined included coronary heart and artery disease, hypertension, ulcers and nervous disorders.

Each major data source was analyzed to determine the number of cases per occupation per data source. These figures were compared to population data for each occupation based on 1970 census data for Tennessee. The data for each occupation were then statistically analyzed to determine the relative stress rating of each occupation and of major occupational groups. The statistical analysis techniques used to evaluate the data included cluster analysis, multivariate analysis of variance and multiple comparisons.

The data were examined by clustering occupations with similar incidence for all three data sources. By this procedure forty occupations with a higher than expected incidence of stress-related disorders were identified. Table 1 shows the mean z-scores for the high stress incidence occupations, while Table 2 shows the mean z-scores for the low stress disease occupations. Twelve of the high stress-related disease incidence occupations displayed very significant incidence rates. These were laborers, secretaries, inspectors, clinical laboratory technicians, office managers, managers/administrators, foremen, waitresses/waiters, operatives (machine), farm owners, mine operatives, and painters.

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Table 1

OCCUPATIONS WITH HIGH INCIDENCE OF STRESS RELATED DISEASES*

Occupation	Cluster	Cluster Rank	Mean z-scores for Death Certificates	Mean z-scores for Mental Health Adm.	Mean z-scores for General Hospital Adm.
Laborers	10	1	216.84	97.99	44.85
Secretary	9	2	-2.40	42.64	25.95
Inspector	8	3	5.76	10.71	17.80
Clin. Lab. Tech	8	3	0.57	5.87	17.46
Office Manager	8	3	0.57	0.16	14.48
Foreman	6	4	0.84	-9.50	12.07
Manager/Admin.	6	4	4.26	-13.76	20.05
Waitress/Waiters	2	5	0.13	26.15	-1.13
Operatives	2	5	-13.74	16.52	0.25
Farm Owner	7	6	35.30	-3.60	-8.50
Mine Operative	7	6	21.97	0.33	-2.16
Painter (not Artist)	7	6	15.09	-0.38	-2.71
Health Technology Technician	1	7	-1.04	10.55	8.06
Practical Nrse.(LPN)	1	7	-1.41	12.56	3.92
Nurses' Aide	1	7	-0.97	10.82	-0.09
Musician	1	7	-1.30	6.77	1.41
Dental Assistant	1	7	-1.84	3.22	1.13
Teacher Aide	1	7	-2.97	4.35	0.52
Computer Programmer	1	7	-2.65	4.20	-0.63
Bank Teller	1	7	-3.87	3.37	0.76
Health Aide	1	7	-2.72	2.99	3.20
Social Worker	1	7	-3.17	3.87	2.97
Registered Nurse	1	7	-2.18	5.27	3.65
Telephone Operator	1	7	-3.40	6.12	-0.87
Hair Dresser	1	7	-5.24	7.39	0.42
Warehouseman	1	7	1.73	4.01	6.14
Sales Manager	1	7	2.94	1.93	7.53
Clergy	1	7	1.46	1.27	5.44
Sales Rep.	1	7	4.00	-0.41	6.17
Police	1	7	2.56	-1.79	4.73
Railroad Switchman	1	7	2.96	-2.68	4.20
Meat Cutter	1	7	2.56	-0.86	0.71
Electrician	1	7	3.53	-1.84	2.98
Fireman	1	7	2.02	-2.16	2.67
Plumber	1	7	3.62	-3.11	1.75
Structural Metal Craftsman	1	7	7.25	2.44	1.39
Guard/Watchman	1	7	10.24	0.97	4.09
Machinist	1	7	9.89	2.18	6.46
Mechanic	1	7	9.79	2.68	8.86
Public Relations	1	7	1.14	5.09	2.19

*Initial twelve occupations only are rank ordered.

Table 2

OCCUPATIONS WITH LOW INCIDENCE OF STRESS RELATED DISEASES

Occupation	Cluster	Cluster Rank	Mean Z-scores for Death Certificates	Mean Z-scores for Mental Health Adm.	Mean Z-scores for General Hospital Adm.
Sewers	5	10	-14.46	-13.31	-14.07
Checker, Examiner	5	10	-9.16	-10.47	-8.55
Stockhandler	5	10	-7.42	-8.45	-8.16
Craftsman	5	10	-6.54	-8.64	-8.63
Maid	5	10	-1.09	-7.66	-14.84
Farm laborer	5	10	-7.21	-6.22	-9.85
Heavy equip. oper.	5	10	-4.88	-9.63	-8.96
Freight handler	5	10	-6.62	-7.71	-7.30
Child care worker	5	10	-6.59	-3.99	-6.08
Packer, wrapper	5	10	-6.09	-6.85	-3.06
College/Univ. prof.	5	10	-6.26	-4.42	-5.00
Pers./Labor relat.	5	10	-3.50	-4.81	-5.02
Auctioneer/Huckster	5	10	-3.44	-4.43	-4.23

In addition to the twelve highest stress-related disease incidence occupations, there were trends in the remaining twenty-eight high stress incidence occupations that bear mentioning. Six of the occupations were in the health care field--health technology technicians, licensed practical nurses, registered nurses, orderlies and nurses' aides, health aides, and dental assistants. These occupations all require a great deal of interaction on a continuous basis with persons who are ill [illegible] can produce a feeling of being emotionally drained. In addition, they all [illegible] a great deal of responsibility for the welfare of their patients without the authority to have complete control over that welfare.

Another interesting group of high stress-related disease incidence jobs were all of a blue-collar skilled or technical nature. These jobs included machinists, mechanics, structural metal craftsmen, plumbers, electricians, and meat cutters. These types of jobs afford the use of learned skills [illegible]ay quite well and should allow for a moderate amount of job satisfaction. However, Caplan (1975) found that machine tenders and assembly machine operators reported high levels of job dissatisfaction, boredom, somatic complaints, anxiety and depression. The other occupations listed above were not studied by Caplan, but his results do indicate the fallacy of implying that a job should give satisfaction just because some skills are involved.

Still another distinct set of occupations within the cluster of twenty-eight high stress-related disease incidence occupations were in the area of human and public services. These included social workers, therapists, clergy, police and detectives, and firemen. All of these occupations perform services for the public. While these services are seen as vital to the public welfare, they are not afforded public recognition or gratitude in equal measure to the services rendered.

Finally, there is a group of high stress-related disease incidence occupations related to public contact and sales. These jobs include sales managers, sales representatives and public relations. As with many of the high stress-related disease incidence occupations discussed earlier, these occupations involve constant pressure for production and success.

One of the most interesting aspects of evaluating all of the high stress-related disease incidence occupations, which vary widely in their job requirements, is the similarity of certain stressors in these occupations. For instance, most all of these occupations require a fast workpace with little chance of relief from the pace. Many of these occupations require long working hours, repetitive and/or boring job tasks and produce an overall feeling of pressure, tension and anxiety without outlets for these feelings. Of equal significance to the similarity of stressors in these occupations is their differences in stressors. It is possible that the similarities of stressors produce an overall sense of distress which can be exacerbated by stressors specific to each occupation, thereby increasing the overall stress level to such a point that the outcome is a significant health strain. The major stressors (pacing, boredom, long hours) set the worker up or increase his overall sensitivity to specific stress aspects of a particular occupation. This type of hypothesis is supported by the wide variety of occupations showing high stress-related disease incidence which display some similarities in occupational stressors but which vary greatly in the job tasks performed and in the number and type of job stressors.

The thirteen low stress-related disease incidence occupations included sewers, checkers/examiners, stockhandlers, freight handlers, craftsmen, maids, farm laborers, heavy equipment operators, child care workers, package wrappers, college/university professors, personnel/labor relations workers and auctioneers/hucksters. There were 87 occupations that had a stress-related disease incidence that was within expected limits.

Mental Health Incidence Rates

The mental health data for this study were collected from records of twenty-two of the twenty-seven mental health centers operated by the State of Tennessee (the remaining five chose not to participate). These centers, located throughout the state, provide a full range of diagnostic and therapeutic outpatient services. The records of all first admissions to the twenty-two participating mental health centers from January, 1972 through June, 1974 were examined for their relevance to the present study.

Records containing the frequency and diagnosis for all admissions meeting the occupation, age, and residency selection criteria were examined. Diagnostic information, age, sex, and race for each case were recorded after removing all personal identifiers (e.g., names and social security numbers). Data were recorded for a total of 8,450 cases. Table 3 presents the characteristics of sex, age, and race for the mental health admissions and total work population, based on the hospital records and the 1970 Bureau of Census data, respectively. It can be seen that females were proportionally more likely than males to receive treatment from one of the mental health facilities. They comprised fifty-three percent of the admissions but were only thirty-nine percent of the working population. Males, on the other hand, comprised forty-seven percent of the admissions but were sixty-one percent of the working population. A chi-square analysis showed the difference between male and female admissions to be statistically significant ($x^2 = 8.24$, $df = 1$, $p < .01$), using expectancies based on census norms. The dis-

Table 3

MENTAL HEALTH ADMISSIONS BY SEX, RACE AND AGE FOR AGES 18 THROUGH 64

	% Mental Health Admissions (n = 8,450)	% Employed Population* (n = 1,345,610)
Male	47	61
Female	53	39
White	89	87
Black	11	13
Average age	33 years	39 years

* Tennessee, employed in major occupations in 1970, ages 18 through 64.

tribution by races in the mental health center records data was almost identical to that in the state population (89% white admissions to 11% black admissions). The mean age of the patient group was thirty-three years as compared to thirty-nine in the working population.

To rank-order the major occupations in terms of the relative incidence of mental disorders, two separate analyses were performed. The first involved computing the sample frequency of admissions for each occupation relative to the working population frequency of that occupation. The resultant score was then multiplied by 1,000, resulting in mental health center admissions rates per 1,000 employees for each occupation.

The second anlaysis involved the computation of z-scores for each occupation, comparing the observed frequency of admissions per occupation in the sample with the expected frequency of that occupation in the sample, based on the population norms supplied by the 1970 census data. It is assumed that the relative frequency of a given occupation in the sample should not significantly exceed the relative frequency of that occupation in the population. Since the purpose of this study was to identify those occupations exhibiting a high incidence of mental disorders --and therefore positive z-scores--a one-tailed test of significance was used ($z = 2.33$, $p < .01$). Those occupations with significant z-scores were considered to have a higher incidence of mental health problems than would be expected from population norms.

Table 4 presents a rank-ordering, based on admission rates, of the 30 occupations with the highest incidence of mental health problems in the sample, along with their respective z-scores.

It can be seen from Table 4 that health technicians exhibited the highest incidence of mental disorder admissions, followed by waiters and waitresses, practical nurses, inspectors and musicians. The z-scores tended to substantiate the rank-ordering based on incidence rates, as indicated by the fact that the top twenty-four occupations had a significantly higher than expected admission rate based on population norms ($z = 2.33$, $p < .01$).

TABLE 4

OCCUPATIONAL ADMISSION RATES AND Z-SCORES FOR MENTAL HEALTH ADMISSIONS

Rank	Code	Occupation	Sample n	Z-Scores**	Admission Rates* (per 1,000)
1	1098	Health Technol. Tech. nec	39	10.55	30.68
2	7215	Waiters, Waitresses	370	26.15	23.46
3	7136	Practical Nurses LPN	102	12.56	21.39
4	5105	Inspectors	81	10.71	20.45
5	1134	Musicians	37	6.77	19.14
6	1162	Public Relations	22	5.09	18.70
7	1034	Clinical Lab. Tech.	42	5.87	15.90
8	7054	Dishwashers	29	4.84	15.80
9	8216	Warehousemen	23	4.01	14.94
10	7135	Nurses' Aides	181	10.82	14.44
11	8113	Laborers	488	97.99	14.28
12	7051	Dental Assistants	18	3.22	13.89
13	4219	Teacher Aides	33	4.35	13.86
14	1169	Research Workers	18	3.02	13.30
15	1040	Computer Programmers	35	4.20	13.27
16	1154	Photographers	13	2.47	12.96
17	4205	Telephone Operators	85	6.12	12.69
18	7095	Hairdressers	127	7.39	12.58
19	1149	Painters, Sculptors	13	2.28	12.33
20	7096	Health Aides	25	2.99	11.93
21	6198	Taxicab Drivers	23	2.86	11.91
22	1025	Chemists	24	2.80	11.64
23	4009	Bank Tellers	43	3.37	11.00
24	1187	Social Workers	60	3.87	10.85
25	5171	Roofers-Slaters	14	1.81	10.34
26	4182	Secretaries	621	42.64	10.50
27	1137	Nurses, Registered	136	5.27	10.34
28	6141	Operatives	1291	16.52	10.21
29	5007	Bakers	14	1.48	9.81
30	5194	Struc. Metal Craftsmen	38	2.44	9.80

* For the entire sampling period of over two years (not annualized).

** Underlined z-scores are significant ($z \geq 2.33$, $p < .01$), using a one-tailed test.

It is interesting to note that of the top twenty-two occupations, six are related to hospital/health care operations. These are: health technologists, practical nurses, clinical lab technicians, nurses' aides, health aides, and registered nurses. It may be that particular stressors present in the hospital environment are conducive to the development of mental disorders.

As can be seen by comparing the combined data with just the mental health data, differences in occupational rankings occur. This serves as a warning that various data sources will yield results related to the disease processes they reflect. Because of this, a great deal of thought must go into collection of data for determining overall incidence by occupations for stress-related disease so that accurate estimates and comparisons can be made.

MASS PSYCHOGENIC CONTAGION REACTION IN INDUSTRY

Another major NIOSH stress research project deals with evaluating mass psychogenic contagion reactions in industrial establishments. In such outbreaks typically a number of workers will simultaneously become ill at their worksites. The specific symptoms may vary from worker to worker but generally involve subjective types of complaints such as dizziness, weakness, difficulty in breathing; complaints characteristic of an anxiety reaction and the hyperventilation syndrome. The affected workers, in reporting their symptoms, frequently attribute their onset to some physical characteristic of the work environment, such as, a strange odor, a glue or solvent used in the work operation, or any of a variety of other potential causes which appear plausible in terms of the expressed symptomatology and work conditions. As rumors of the illness spread throughout the plant and new cases continue to be reported, worker anxiety and general confusion may escalate to such an extent as to necessitate a plant shutdown. At this point assistance might be sought from local or state occupational health agencies; or the Occupational Safety and Health Administration might be contacted in an attempt to get a determination of the probably cause of illness and recommendations for remedial action.

Regardless of the agency or agencies involved, the investigative team is likely to consist of an industrial hygienist, a nurse or medical assistant, a physician, and possibly a toxicologist. Following environmental sampling of the work environment for chemical toxicants and medical/biochemical examinations of the workers for consistent pathologies, a report is prepared for dissemination to all involved parties, describing the methodology, results, and conclusions of the investigation. In those cases where no physical pathogen has been identified, and the investigative team senses a high degree of stress and anxiety among the workforce, the report might suggest that psychological factors may have played a contributory, if not a primary, role in the etiology of the illness. Such a suggestion is always made with considerable caution, however, having been arrived at by a process of elimination and based primarily on impressionistic rather than empirical evidence.

The affected workers, in all probability, have spontaneously recovered from their symptoms by this time and have returned to their jobs. Management is relieved to return to normal production and is quite happy to let the whole incident pass. The investigative team, with a sense of failure and ambiguity at not having identified the "real" cause, leaves the plant no better prepared to cope with the next such incident. The whole episode thus ends as abruptly and mysteriously as it began and the final report is unceremoniously buried in agency files.

Perceiving a need for psychological evaluation and intervention in cases of mass psychogenic illness in industrial settings, we initiated a programmatic research effort to study this phenomenon in June, 1977. In the past year, we have investigated outbreaks of mass psychogenic illness in three plants, and were made aware of at least a half dozen more which we were unable to study for one reason or another.

In these three incidents we have worked in close conjunction with occupational physicians and industrial hygienists as members of the health hazard evaluation team. Besides conducting individual interviews with the affected workers, we have surveyed a random sample of affected and unaffected workers at each worksite with a rather intensive questionnaire which we specifically developed for this purpose. In addition to sociodemographic characteristics such as age, sex, level of education, and marital and parental status, the questionnaire requests information of an epidemiological nature such as the date and time of illness onset, symptomatology and location of workstation at the time of illness onset. A rather extensive medical history and somatic complaint checklist is also included in the survey instrument.

The primary emphasis of the questionnaire, however, is on assessing those state or trait characteristics of the affected workers which make them susceptible to mass psychogenic illness and in determining the mechanism or social network by which the symptoms and related beliefs are transmitted throughout the workplace.

We are still in the initial development stage of our methods to evaluate these mass psychogenic outbreaks. We plan to field test and modify our instruments over successive incidents, thereby maximizing their discriminant validity. Our data base at present is relatively small and consists of roughly 100 affected workers and 100 unaffected workers, sampled from incidents occurring in three separate plants. Although only a small number of workers have been evaluated thus far, some consistent patterns are beginning to emerge in the survey data.

In general it appears that mass psychogenic illness primarily affects women in a predominantly female workforce who are experiencing physical and psychological job stress and concomitant physical strain. The specific symptoms may vary across incidents, and from individual to individual within a site, but typically consist of subjective somatic complaints, such as headaches, nausea, and chills. The actual outbreak of illness is usually triggered by a physical stimulus, for example, an odor, which is perceived by one or more workers and which is believed to be the source of the discomfort. Comparisons of the survey responses of affected and unaffected workers indicate that within a worksite, affected workers report experiencing more discomfort from physcial stressors (work pace, poor lighting, noise) and psychological stressors (role ambiguity, lack of social support, boredom). It appears as though peer and supervisory relations are of particular importance as potential precipitators of mass psychogenic illness. Similarly, psychological evaluations have been fairly successful in differentiating between affected and unaffected workers, in particular in response to hysteria and hypochondriasis scales.

While a few of the psychological state and trait measures and stress factors have been discriminating between affecteds and unaffecteds, we are not satisfied that we have presently developed sensitive enough measures for accurate evaluation of mass psychogenic incidents. One of the most serious difficulties seems to be that most clinical psychological evaluation instruments are designed, developed

and validated on institutionalized patients suffering from psychogenic trauma. The populations which we are studying are functional, working individuals who do not display the extreme symptoms of the institutionalized patient. Therefore the tests which have been developed around the patient population are not sensitive enough to diagnose the less severe symptoms of the workers being affected by job stress factors. Because of this we have had to design, validate and refine our own psychological evaluation instruments for measuring such factors as anxiety, tension and depression in a normal, functional population. These instruments must be sensitive enough to detect slight shifts from normal which are at a sub-clinical level and can distinguish affected from unaffected normal workers. This process is one of continuing refinement and it will undoubtedly take a number of mass psychogenic incidents to produce useable, sensitive instruments. It is hoped that further development and refinement of this questionnaire will result in an instrument which can be used in conjunction with environmental, hygiene and medical data to make "mass psychogenic illness" a legitimate diagnostic category.

MACHINE PACING AND STRESS

The final research project that we would like to discuss deals with the health consequences of machine-paced work operations. Our research in this area is just in the initial phases but we already have some preliminary indications that machine-paced operations are capable of producing stress reactions related to serious health consequences. In work reported earlier in this paper and in research conducted for NIOSH by the University of Michigan (Caplan, et. al., 1975), machine-paced operators displayed very high levels of job stress and high incidence of stress-related disease in relation to other occupations. Because of this, we have undertaken a multi-faceted research program to determine the specific stressors associated with machine-paced operations and to evaluate health impairment associated with such job activities. This program includes field evaluations of job stress factors, health and safety record studies and laboratory simulation studies.

We would like to briefly discuss the different studies in this program and findings to date.

In a recently completed pilot study done under contract by Canyon Research, the ability to determine relative health risk for machine-paced assembly operations versus self-paced assembly operations using plant health records was assessed. In this study, data were collected from accident reports, dispensary reports and doctor reports for workers involved in machine or self-paced assembly operations in four medium-sized assembly plants. Statistical evaluation of the data indicated that there were no differences in any of these indicators between machine-paced and self-paced assemblers. However, the study did indicate serious deficiencies in the data available at the plant sites which could place serious limitations on any large scale study designed to use such company records to evaluate the health effects of machine-pacing on a retrospective basis.

A second study involves following workers engaged in mail-sorting machine-paced work from their first assignment as machine-paced operators and for two years after assignment to determine stress and health effects related to their work. In this study, which is being carried out jointly with the University of Wisconsin (Dr. Robert Arndt), psychological stress, current health status, and biological indicators of stress and strain will be measured at six month intervals during the

course of the two-year period. Changes in stress level and health indicators will be examined and related to machine-paced work. Currently, baseline medical, biological and psychological indicators of stress have been taken for fifty first-time machine operators. Before the six-month follow-up, approximately one-half of these operators had quit their job. An evaluation as to why these operators quit is currently underway using in-depth psychological interviews. The six-month psychological follow-up has been completed on the remaining twenty-six operators and that data is currently being evaluated. Preliminary data evaluations indicate increased catecholamine levels and high levels of psychological stress.

A third study in this area, which has not yet been started, will be a field examination of job stressors related to machine-paced operations. This study will be carried out via contract and will involve a national survey of mail-sorting machine operators in order to define aspects of job operations that produce job stress which interact with machine-paced stressors.

The final area of NIOSH stress research that we plan to discuss is the laboratory simulation of stressors to examine stress reactions under controlled conditions. At the NIOSH research laboratory in Cincinnati, we have established a stress evaluation laboratory equipped with subject monitoring and response recording equipment for examining physiological reactions, time study analysis of work activities, motor system reactions, psychological status, and biochemical changes. In addition, we have a real-time Digital Equipment Corporation 11/34 on-line computer system for control and evaluation of the experimental parameters under study.

At the present time, the major study underway in this laboratory is aimed at simulating machine-paced operations using two different tasks--a two-hand key pressing task and a video-terminal direct data entry task--and evaluating subject stress reactions to variations in particular variables related to machine-pacing operations such as task speed, task complexity and social interaction. Currently, we are in the process of building the machine-pacing simulators and developing work tasks that will be related to real-world stress problems, as well as developing computer programs for simulating the tasks. It is anticipated that this research will be able to pinpoint critical factors in machine-pacing related to stress problems that cannot be ferreted out in field research studies.

The NIOSH stress research program currently has other research underway besides the studies mentioned. One of these studies, dealing with safety and health consequences of shiftwork, will be discussed later by Dr. Donald Tasto of the Stanford Research Institute, who is conducting this study for NIOSH under contract. In addition, we have studies examining stress problems in specific occupations (police and coal mining), the relationship between stress and coronary heart disease risk, pink collar (secretaries, typists, clerks, data entry operators) stress problems and stress reduction approaches (biofeedback and relaxation therapy). We feel that we have a diverse program that is examining occupational stress from many angles and developing means for reducing the health consequences of job stress.

REFERENCES

Caplan, R.D.; Cobb, S.; French, J.R.D.; Van Harrison, R. and Pinneau, S.R. 1975. Job Demands and Worker Health. U.S. Department of Health, Education and Welfare Publication No. (NIOSH) 75-169.

Colligan, M.J.; Smith, M.J. and Hurrell, J.J. 1977. Occupational incidence rates of mental health disorders. Journal of Human Stress. Vol. 3, No. 3, pp. 34-39.

U.S. Bureau of the Census 1972. 1970 Employment Patterns by Occupations in the State of Tennessee.

THE HEALTH CONSEQUENCES OF SHIFT WORK

Donald L. Tasto, Ph.D.*

In the summer of 1975, the National Institute for Occupational Safety and Health (NIOSH) awarded a contract for a project on the health consequences of shift work to SRI International, Menlo Park, California. At the time, shift work was primarily found in industries where it was necessary to offer round-the-clock services, such as in hospitals, or to maintain 24-hour operations as in pulp and paper plants. Recently, however, another phenomenon is increasing the prevalence of shift work in this country, and will undoubtedly increase it to an even greater extent in the near future.

As energy utilization has emerged as a critical problem, it has become clearer that one of the main difficulties in designing energy plants is that they have to be large enough to handle loads at peak times; but this inevitably means that at other times they have more capacity than they need. To help level out demand, and thus make their plants run more efficiently, energy companies are reducing prices for energy utilization at other than peak hours. This is inducing many energy-intensive firms to take advantage of reduced costs at off hours by putting on afternoon and evening work shifts.

The *Wall Street Journal* recently published two separate articles on this topic, showing, among other things, that the differential in costs for states in which an off-hour rate now applies is considerable. The savings in energy costs well exceeds potential increases in wages for off-hour shift work. I believe more and more companies that have never heretofore seen the advantage in shift systems will begin to start using afternoon and night shifts because of this inducement.

However, we need more information on the effects of working these shifts on the health and well-being of the workers who will be employed for afternoon and night work. What happens when their conventional daytime routine is broken up this way? Because few studies have been conducted on this issue in this country, there is still inadequate information on the American worker's adaptability to shift systems.

We do know what happens in general when you invert your sleep cycle, whether you do so by traveling halfway around the world or by staying here and working at night. Either way, inverting the sleep cycle interrupts those body rhythms called circadian rhythms, or diurnal cycles, which are manifested in body temperature, blood pressure, pulse rate, urine volume, urine components, and in certain endocrine functions. And we know that as you adjust to an inverted sleep-wake cycle, these 24-hour rhythms begin to come back into phase at different rates, so they are no longer in synchronization: one of the main effects of disrupting sleep cycles is to desynchronize circadian rhythms in the body. Ad-

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justment to inverted sleep cycles and resynchronization of circadian rhythms can take as little as three or four days, or it can take as long as a few months. Some people never adjust completely to night work.

We also need to know whether disrupting circadian rhythms in this way is related to the increased prevalence and severity of health problems, accidents, psychological disorders, and social maladjustments. The results of the NIOSH-SRI study are, I believe, a significant contribution to our understanding of these areas.

Our preliminary review of the literature in the field indicated that not only sleep patterns, but also eating and digestion patterns were clearly susceptible to disruption by afternoon, night, and rotating shift work schedules. As one might expect, elimination problems, such as constipation and diarrhea, are also common.

However, few illnesses, with the possible exception of gastrointestinal ulcers, have been clearly linked to shift work. Certain studies show an increased frequency in the rate of ulcers among rotating workers as compared to day shift workers (8.1).

The NIOSH-SRI study included 2,400 subjects: 1,200 nurses and 1,200 food processors. We originally intended to sample six different occupational populations, but various design and procedural constraints required us to reduce the sample to three groups: nurses, food processors, and coal miners, all of which have large numbers of shift workers. We then discovered that coal miners' health records are kept with their private physicians, not at onsite work clinics, so we also dropped that occupation from the study sample.

Each sample group was composed of equal numbers of day, afternoon, night, and rotating shift workers. Rotators tended to come from different organizations altogether than did the permanent day, afternoon, and night shift workers because individual companies do not, by and large, combine permanent (or fixed) shift systems with rotating systems. The entire 24-hour span can be covered by either assigning workers permanently to each of the three basic shifts, or by having them rotate among them. Although few companies now use a blend of both systems, we feel, as we discuss below, that such a mixed system would improve worker adaptation to shift work.

There were two phases to the study. In the first, we reviewed worker health and safety files and compiled information on three major outcome variables--sick days, clinic visits, and accidents--for the previous six months. In the second phase, we distributed a questionnaire to about 3,500 workers, again dividing our distribution equally among day, afternoon, night, and rotating shift categories. The response rate was slightly under 60%; about 2,000 questionnaires were returned to us.

We first looked at the sick day variable for the nurse sample. Our analyses showed that rotating nurses tended to take slightly more sick days than all other workers assigned permanently to a shift, regardless of which shift that happened to be. But the difference between rotators and permanent shift workers was not significant, indicating that rotators were not taking many more sick days than were permanent workers.

We then looked at the reasons that nurses gave for taking time off sick, and we noticed that again there was a clear difference between rotators and all fixed-

shift workers: rotators tended to give more serious reasons for taking sick days than did fixed-shift workers. Among the fixed-shift group (comprising all permanently assigned day, afternoon, and night workers) the reasons for sick leave tended to be the same: headache, colds, earache, and so forth. But rotators tended to give more serious reasons, such as acute respiratory infection and upper-GI tract distress.

The same pattern prevailed in the food processor sample: the total number of sick days taken was about the same for rotating and fixed-shift workers, but the rotators gave what appear to be much more serious reasons for taking time off.

It was only when we then looked at information on clinic visits that our data began to seem quite revealing. Not only did rotators tend to go to worksite clinics much more often than did workers permanently assigned to their shifts, but they tended to go for the same reasons that fixed-shift workers gave as excuses for taking sick time.

In short, rotators used their sick leave for graver complaints while they visited the clinics at the worksite for the same reasons that caused fixed-shift workers to stay home. Rotators didn't take more sick time off because sick time is limited for all workers.

We concluded that the number of sick days taken was not a reliable indicator of health problems. One must also carefully analyze the reasons given for sick leave, the total amount of sick leave allowed, and the attendance patterns at onsite health clinics, where these are available to workers.

Unfortunately, we were unable to analyze corresponding clinic-visit data for food processors because most sites that used a rotating shift system did not maintain clinics.

The same patterns were confirmed by our data on accidents. Rotating workers had more total accidents than did fixed-shift workers. About 20% more rotators than fixed-shift workers had reported having at least one accident during the six months prior to our records review.

Our examination of the kind of accidents reported was not particularly fruitful. Rotators tended to have significantly more finger and superficial leg, hip, and foot injuries, but we concluded that, by and large, it was not the type so much as the small increase in incidence of all accidents that differentiated rotators from fixed-shift workers.

The questionnaire phase of the study led to more general findings. There do not appear to be radical differences in general health variables that are attributable to shift differences. Other areas of analysis for the questionnaire phase included sleep patterns, eating and digestion patterns, psychological mood, and life style, including personal, domestic, and recreational pursuits.

Disruption of sleep patterns seems to be the most widespread problem imposed by shift work. It tends to affect both recent and long-term shift workers alike.

Shift work also interferes with the domestic life of almost all workers who have off-hour schedules, particularly with respect to their sexual activities and their childrearing responsibilities. However, worker satisfaction on these variables

seems not to be so much a function of the absolute amount of time available as the compatibility of this time with others' schedules.

We found no evidence that shift workers were suffering from severe health problems, though some do report increases in stomach and digestion disorders, including constipation.

There was some indication that shift work may be related to decreased psychological well-being. Workers understandably do not like having to orient themselves to one schedule at work and to a dissonant schedule in their social and personal lives.

One very promising area of study in this field is that which focuses on the relationship between accidents and performance efficiency. One might reasonably posit that accidents tend to be an indicator of worker errors, and thus a high number of accidents would imply less efficient performance. As we saw earlier, rotators generally incur more accidents than fixed-shift workers, possibly because of the disruption of their diurnal cycles that their work schedules cause.

Past research has demonstrated that body temperature is also predictive of performance. Specifically, Prof. W. B. Colquhoun found in 1976 that British sailors, who stand rotating four-hour watches at sea and thus undergo constant disruption of sleep-wake cycles and, presumably, circadian rhythms, performed better on a simple task as their body temperature rose. But when the task was made somewhat more complex, the direct relationship between temperature and performance efficiency disappeared. And when the job became quite complex, the relationship turned out to be inverse: high body temperature meant worse performance.

For most of us, body temperature is low at night, and rises during the day until about noon or so, when it levels out. We tend to be most efficient, within broad limits, during the afternoon and evening hours. Of course, there are also those of us with speedier metabolisms--the "morning people"--who find that their efficiency peaks earlier in the day and then drops as the afternoon wears on.

Rotation, however, makes it especially difficult to match job demands, body temperature, and performance efficiency, especially since, as Colquhoun's study demonstrates, the complexity of the task is an important variable. More recent studies have also shown that the demands that the task makes on worker short-term memory capacity is also a factor in this complex relationship.

Companies that now use or that are planning to inaugurate shift systems should, in our opinion, understand that worker dissatisfaction can be intensified by the interference of work schedules with social and domestic activities. And, as any competent business manager knows, low morale is costly.

It should be possible, though, to encourage worker adaptation to shift work by maximizing worker shift preference. We feel this can be done by offering both fixed-shift as well as rotating assignments, and by offering both rapid and slow rotation intervals. An afternoon shift worker whose spouse works days may want to move to the night shift. Single employees may wish to choose any shift but the afternoon shift so as to leave their evening hours free for social pursuits.

Some individuals, such as air traffic controllers, even prefer to rotate quite rapidly from shift to shift. This leaves them with very busy work schedules in one part of the week, but a great deal of uncommitted time on other days.

It should be relatively easy to assess worker preferences and then to maximize a successful match between those choices and all the possible permutations of shift work scheduling. The complications of monitoring and assessing worker selections should be offset by what we believe would be a clear improvement in worker morale and a consequent reduction in turnover rates. We found in the NIOSH-SRI study that hospitals using only rotation systems had considerably higher turnover rates than those using only fixed shift systems. Mixing rotation and permanent assignments would, we believe, reduce turnover rates even more.

Researchers interested in studying shift work may encounter difficulty in obtaining the cooperation of management and labor. We fortunately did not, but a consultant to our project, Paul E. Mott, author of a comprehensive shift work study published in 1965, did have some trouble gaining access to certain organizations. As a result of his experience, Mott feels that union and management representatives should be approached simultaneously.

Most of the hospitals participating in our study were not unionized. Those that were offered us no obstacles.

At the food processing sites, we elected to approach management first and describe our study, explaining that it was exploratory, that we were just beginning to research the area of adaptation to shift work, and that we would appreciate their cooperation. About half of the plants we approached declined to participate. Several of these stated that they were currently involved in labor negotiations. We received very good cooperation from those that chose to participate, though none wanted to have their names disclosed in our final reports or in discussions of the study's results. This last stipulation necessitated devising an elaborate system for protecting the confidentiality of questionnaire respondents.

After management had consented to involvement in the study, we approached union representatives. In only one case did unions veto the participation of their members. In some cases, management itself handled further contact with union representatives and we were not required to explain the study a second time to union officers.

Two small factors that helped us win the acceptance and cooperation of these hospitals and food processing plants were: (1) we paid respondents five dollars for completed questionnaires, and (2) we did not intrude on work hours; questionnaires were sent directly to the worker's home address.

Future studies in this area would, in our opinion, be well advised to focus on a small number of workers from relative few firms, rather than twenty-four hundred individuals from some twenty-odd sites. Multiple measures, taken over a more prolonged time period than was possible with our one-shot design, should make it possible to considerably refine the current understanding of the health consequences of shift work.

HEART STRESS: THE CONCEPT OF "TYPES A & B"

Stephen R. Elek, M.D.*

I am going to present a clinical portrait to you about the type of individual who is likely to, and prone to, develop heart disease. One would think that this personality profile would have been known a long time ago, but it has only been within the past fifteen years or so, based on the pioneer work of Drs. Friedman and Rosenman, working at the Harold Brundt Institute for Cardiovascular Research in San Francisco, that this clinical protrait has become known and understood. It is important to understand a personality profile because it does create proneness to heart disease. That immediately raises the question, "What are the factors that predispose one to heart disease?"

The factors that predispose one to heart disease are: heredity, excessive smoking, high blood pressure, hypertension, diabetes (known or undetected ,excessive cholesterol, inadequate excercise, and obesity. These factors, singly or in combination, contribute to the proneness factors leading to heart disease.

Heart disease is the leading cause of death in this country, and, indeed, in Western civilization. It is a sad and appalling fact, but a true one, nevertheless. Therefore, it behooves us as physicians responsible for the lives of patients, and health of individuals that suffer from this malady, that we know as much about this malady as we can. What is not mentioned in the preceding list of predisposition factors is the personality profile. It is that theme to which I'll address myself.

The "hurry-up" disease, the profile of that individual who is especially prone to heart disease, is called a Type A behavior pattern. That Type A behavior pattern, curiously enough, is well characterized in these six items: intense sustained drive to achieve self-selected goals, profound eagerness to compete; persistent desire for recognition and advancement, continuous involvement in multiple and diverse functions, habitual propensity to accelerate the rate of execution of many physical and mental functions, and great mental and physical alertness.

Now a question arises as to how do we find out about these behavioral characteristics in an individual. We do it by asking questions. And the simpler the question, the better. The questions are directed to elicit three important responses, namely, the extent and drive of ambition, the extent of past or present competitive and/or hostile feelings, and most importantly, the intensity of the patient's time-urgency. And when we can find about about these by simple questioning, then we have learned a great deal about the individual.

Let me give you a sample of the questions we ask. We use a type of medical history, restructured in order to enable the physician or the investigator to learn

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more about the behavioral pattern. For example, in checking for the extent of drive or ambition we will ask the following simple questions:

> Did you participate in athletic or team activities in high school or college?
>
> Were you captain of any of them?
>
> Since making a living, do you tend to improve your chances of advancement by going to school or taking additional courses?
>
> Are you satisfied with your present job?
>
> When you were younger, did you deliberately strive for advancement and do you still do it?
>
> Do you belong to extracurricular community activities; are you a leader in any one of them?

And the answers with regard to the Type A behavior problem are uniformly affirmative. These patients have done all of that and have a high degree of drive and ambition.

The questions designed to elicit the extent of past and present competitive and/or hostile feelings are as follows:

> What do your wife and close friends think about you?
>
> Do you strive for the respect and admiration of your friends and coworkers or do you seek their affection?
>
> When you participate in athletic or other games, do you give them your maximum effort, fighting all the way? Do you play mainly to win or just for the fun of it?
>
> And, by the way, are a fast car driver? Does it irritate you if you are delayed by the car in front of you? Would you rather move him out of the way? What do you say? Do all of your close friends try to slow you down?
>
> Do you often get upset and angry? And how do you display it?

And it becomes obvious that the Type A behavior pattern, the so-called "hurry-up" disease, do all of these things. They are irritated and they bottle it up. They want any person or event that impedes their progress out of the way.

Finally, and most importantly, questions designed to elicit the intensity of the person's time urgency are:

> Are there many deadlines in your work? Do you enjoy them? Are they exciting? Do you accomplish more by working against deadlines or working until the very last minute? Do you prefer to work up to that time?
>
> Does it bother you if you are kept waiting? What do you say or do about it?

Do you become impatient when you see something being done at work or at home slower than you think it should be done?

Do you often try to get something else done when eating alone? Or while in the bathroom? Or while shaving?

Do you become irritated if you have to wait in line at a bank? Movie? Or at a restaurant?

These questions are surprisingly sensitive. If you take these questions and have a good many workers assess their replicability, the statistical results are extremely good. We have to train, however, our physician colleagues to appreciate the enormous sensitivity of these questions, even though they sound almost like non-medical questions. There is no doubt that the results are valid; they give you a great deal of information about the behavior temperament of that individual.

I'll now summarize the behavioral characteristics of the Type A individual, the individual especially prone to heart disease. He has excessive drive and ambition; he is very alert and highly competitive; he dislikes waiting in line; he angers easily and often, but conceals his feelings; he is involved in multiple tasks and, most frighteningly, has an excessive, frenzied sense of the passage of time. It is obvious why that frenzied sense exists. This alert individual has set up so many goals, so many ambitions, and has such a keen and unremitting desire to accomplish them, that only one thing stands in his way--time.

In addition to the above characteristics, these individuals have very distinctive kinetic features. They scowl a lot, have frequent grimaces and use their chewing muscles frequently. They have very vigorous gestures, like those made by Mussolini and Hitler. You will never see the opposite type, Type B, gesture like that because he is not angry or hostile. But you will see the Type A tell you exactly what he thinks. And when you ask the Type A if he likes waiting in line, he says, "I hate it!" If you ask the Type B, he will say, "We'll see what happens."

You will also notice that the Type A individual raises his voice frequently. You can diagnose this on the telephone if you are very alert to this.

With regard to smoking we have a different concept. Is it smoking that leads to coronary disease, or is it the Type A's sense of urgency that leads to smoking? An interesting intellectual question. There is an article I wrote for one of the medical journals which is characterized uniquely by its magnificent illustrations. To my great surprise, the art illustrator of this journal, who resides in New York, called me personally. He said, "Dr. Elek, I really enjoyed your article! I really learned a lot from it." I asked him, "You mean about yourself?" "Exactly, about myself." Then he went on, "But I have to draw pictures and illustrate this. What do you suggest in the way of pictures? And I said, "Well, if you've learned so much about yourself, why don't you draw your own pictures, and I'll learn something, not only about you, but about the subject of coronary proneness." In the illustrations he drew, you can see the time calendar in the back, the vigorous gestures, the time watching (frequent looking at the wristwatch because of the frenzied passage of time).

In one illustration, there was a patient of mine I had described. This man had developed angina at the age of fifty-two. He did not have many hobbies, except

golf. I urged him to play more golf. "Oh, that's not my favorite sport." It's not a highly competitive sport, as you know. But my patient did that, and I remarked to his son how pleased I was that his father was playing more golf. And his son said, "Oh, yes, he's playing more golf, but you don't know the kind of severe Type A my father is." "Tell me about it," I said. "Well, he plays golf a lot. You also know my father is in the drama business. He represents people in theatrical groups, and he buys scripts for purchase and so on. And in between holes he has the caddy reading these scripts to him so he can make a decision as to whether or not he is going to purchase them."

This story illustrates how keen a physician has to be in amassing seemingly unimportant details, or conversely, how easy it is for a physician or an interrogator to miss important details which reveal so much of the individual's personality structure.

One of the interesting things about Type A, and its converse, Type B, is that they handle fats and cholesterol quite differently. The Type B handles his cholesterol quite comfortably. The Type A, however, does not handle his cholesterol very well. Large amounts remain in his blood, contributing to a build-up of the inner walls of the arteries and thus narrowing their openings. The blood supply to the heart is diminished, leading to a high risk of coronary occlusion.

As I mentioned, the individual with the "hurry-up" disease has a staccato voice, harsh with rising inflections. I stated that one can recognize it over the phone --it is very rapid. So we decided that we would take some oscilloscopic recordings of these individuals. The determinations were done by having them read an exhortative paragraph by a lieutenant addressing a combat squad. And this is a kind of psychodramatics, you see. The black line running across an oscilloscope screen is about normal, anything above that is abnormal. You can see the enormous spikes going above the black line. That's the Type A with his agitated, stacatto inflection. The soft, mellifluous, gentle voice of the Type B produces a smooth pattern close to the line indicating the normal level. Oscilloscope recordings such as these have evolved into the stress test used by detectives and the CIA.

They are very combative people. Indeed, they are locked in mortal combat. By mortal, I mean that their personality is eventually going to get them. You can see the whirring rush, the great speed and acceleration of their physical activities. An octopus can be used to represent their involvement in diverse activities.

Now this type of activity is not the only activity that produces distress in contrast to stress. You can produce it in rats with high sound. And high sound and frequent noises are considered one of the major ecological disturbances today. To demonstrate the effects of noise we can look at the cholesterol level of rats when they are subject to types of noise. Rats in a soundproof room develop very little rise in their blood cholesterol. However, when the same rats are exposed to a duration of high sound, they develop a marked rise in their cholesterol. This is another indication that the cholesterol is handled differently under conditions of stress, here namely noise.

Now it is important that I emphasize to you that our studies are based on chronic stress. The results are different, or can be, when you are talking about acute stress. One study is an example of the effects of acute stress. It looks at

changes in blood chemistry after a racing car event of national importance in England. The blood is taken within the hour. Only one set of chemicals is found to be elevated, all the others are normal. The stress chemicals are found to be elevated. These include adrenalin and its chemical cousin, noradrenalin. You can see the marked rise, the bell curve of the production of stress chemicals in racing car drivers. In this instance the cholesterol does not rise. This difference is due to a condition of acute stress, rather than chronic stress.

One of the stresses that society invents for us is April 15. It occurred to us that using this date would be a very good clinical device for studying chemical changes incited or produced by social, cultural or U.S. government stresses. What Friedman, Byers, and Rosenman did was to study the blood cholesterol of certified public accountants. This was very carefully done. Cholesterol levels were tested once a week. The accountants' amount of activity, smoking, food and so on were known. Our subjects were compared with another group. The results were what you would expect. The sharpest rise in blood cholesterol levels occurred April 1-15. These have been duplicated many times by many different investigators. The implication of the study is significant because we can now get away from the frozen concept that high blood cholesterol in humans, or in animals, represents *only* high cholesterol intake. It does represent high cholesterol intake, but high blood cholesterol is also a stress indicator, a stress tag. We can develop high cholesterol levels as a result of stress. Therefore stress is measurable more objectively.

It is necessary to observe these high stress individuals very, very carefully and in an almost non-medical fashion. It is hard to train our interns to do this because they are more interested in the laboratory tests than in the holistic approach to the individual. So we direct their attention to simple things, almost non-medical, but vitally important. Astute observation of the patient is vital.

Looking at a picture of a patient who has just retired, one can see deposits of cholesterol in a most visible area, namely, the eyes. There is a rim of white around the eyes which is seen at the periphery of the pigmented portion of the eyes as a thick white line. This arcus senilis represents cholesterol deposits. It is sometimes normal. When occurring in younger patients, it is absolutely abnormal.

Let's talk about an actual patient--Type A, bad family history, now fifty-six--who already had a coronary attack. I had to work hard to make him show a happy face for a photograph. He usually does not have a happy face. I had him look up and in the picture you can see a white rim around the pigmented portion of his eye. Those are cholesterol deposits. They occur in the individuals who have high cholesterol levels, representing stress over a period of time. You can see the cholesterol deposit only in the eye, but I ask you to stretch your imagination. What if this excessive cholesterol is also depositing in the heart arteries? I think you can more readily and easily understand why the Type A individual is so especially prone to heart disease when this event occurs in the heart arteries.

The same phenomena can be demonstrated in experimental animals. You can compare the eyes of control animals and those on a high cholesterol diet. You can see the deposition of cholesterol in rabbits fed a high cholesterol diet. An intermediate result is obtained with intervention with cortisone because cortisone given to animals will reduce cholesterol. (However, that does not occur in man.)

Now further evidence that the patient with the "hurry-up" disease is significantly and adversely affected is found in slides taken from postmortem individuals. We can look at the artery of a Type B individual who died from other causes. We can see that the three coats of the coronary artery--the inner, middle and outer coat--are quite normal as are other blood vessels of the Type B non-coronary prone individual.

In contrast are the coronary arteries of the Type A individual. In one specimen the clot is already present, the luminal size of the vessel is profoundly reduced, you can see much disturbance in the whole architecture of that artery. It is unusual in epidemiologic studies to have postmortem observations. However, they are very useful. We have demonstrated pathologically that the Type A individual is highly coronary disease prone.

I have been telling you about the behavioral features, the kinetic gestures, the high cholesterol levels, and the increased catacholine production in these individuals prone to coronary disease. Finally, let's look at the clinical data. If we take about 1500 Type A's and a like number of Type B's, and compare the incidence or prevalence of heart disease you will find that Type A individuals have twice as much clincial coronary heart disease (Friedman and Rosenman). Type A individuals have at least twice as many actual heart attacks. With regard to angina chest pain, Type A's have at least twice the amount. Individuals with the "hurry-up" disease have a fourfold incidence of recurrent heart attacks. With regard to fatal events, Type A's have a twice greater incidence. There is an appalling difference then between the Type A's and the Type B's.

It is no wonder that the incidence of heart disease is so great in our country. It is estimated that well over fifty percent of the individuals, men and women, in our country and perhaps in Western civilization, are Type A. That may be because of the way our civilization structures itself. It promotes, abets, and stimulates Type A behavior.

I would like to remark on what causes this disease. This must be disturbing you, as it has disturbed us. We know that hepatitis is in the liver and that ulcer is in the stomach and heart attack is in the heart artery. Where is this "hurry-up" disease? Dr. Friedman and I, who had studied another disorder during World War II, decided not to let this question go. A priori considerations indicated to us that we ought to study the emotional setup, specifically the emotional centers of the brain. We were fortunate in this because preliminary observations in rabbits showed that if you put a needle into the emotional center called the hypothalamus and do not stimulate that animal, very little atherosclerosis or hardening of the artery occurs. However, if you stimulate that animal three to five minutes twice a day, every day for three months, you see a profound deposition of cholesterol in the major arterial vessel.

So we proceeded to investigate this further, but in smaller animals--for various technical reasons. We chose again to work in the hypothalamus, a very significant area. There are important fibers running between the hypothalamus and the lower organ, which is the pituitary. The production of many of the chemicals manufactured by the pituitary are stimulated by the activity in the emotional center, the hypothalamus.

In our experiment, we insert a small needle in the animal's hypothalamus to get a bull's-eye lesion. We have to hit two or three of these areas of the hypothalamus to get the results we do. The lesion, by the way, in no way hurts the ani-

mal. The only thing that happens is that the animals become extraordinarily hostile. You cannot handle them in a docile way. That is exactly what happens in man. So the simulation is not bad at all.

The reason for creating the lesion in the hypothalamus is to try to evaluate whether the emotional center is, as we suspect, profoundly disturbed in the Type A individual. We then studied the chemical changes in the animals with lesions. Notably the cholesterol level changes (remember, it is the cholesterol that admirably, or otherwise, rises in the Type A disease). The control animals show no rise in cholesterol.

If you produce this lesion in the emotional center, and if to that animal you feed a small degree of cholesterol, you will get a profound increase in cholesterol levels. The increase is so great that you need no statistical correlation. But we have them nevertheless. The cholesterol level of the experimental animals rises three or four times that of the control animals. And we have produced this change many, many times.

We now have some understanding of why it is that the individual with the "hurry-up" disease has a high cholesterol level. We know that his emotional center is disturbed. There are only two drugs, by the way, that will lower this cholesterol level--one is glucagon which mobilizes blood sugar, and the growth hormone. Presence of the growth hormone is necessary for normal cholesterol. What happens in the highly stressed individual is that the amount of his growth hormone drops. Similar studies made by NASA at Palo Alto on levels of growth hormone indicate the same thing. So by giving growth hormone to the prolongly stressed individual, we do lower the cholesterol level. If the amount of his growth hormone drops, his cholesterol level rises.

This is how the English describe what happens to Type A individuals. The English call it autoaggression, we call it the "hurry-up" disease or Type A behavior. More catacholamines are produced, releasing more fatty acids which release more fat and cholesterol, ending up finally with plaques in the blood vessels. We cannot reverse the process. We do know we can have it occur in the given sequence. The feedback mechanisms from the brain to the hypothalamus and pituitary are enormous. Many of the chemicals produced are known and isolated, so we can manipulate them.

This is a schematic picture of the stress interrelationships in the brain. Environmental stresses impinge upon the cortex, uniquely stimulate the hypothalamus. The hypothalamus then, in some way, pours out chemicals. The cholesterol level rises. The cholesterol goes to the liver where it is not handled properly, and so remains at high levels in the blood. The longer the cholesterol remains in the blood, the longer the period over which there is a narrowing of the blood vessels, and the greater the hardening of the arteries.

Let's look at some means of treatment. You know what the environmental stresses are: disturbed ecology, inflation, limitations of space, and so forth. As treatment, is TM good? Is biofeedback good? Is it an emotional aspirin? (If so, it is an aspirin of short duration, and useful as well.) What do we place between mental stresses and the hypothalamus? We do not have very good measures for treating these patients. Actually the best treatment at this time is recognition of the problem and advancing an understanding of it.

I should say that my remarks about the Type A individual are not meant to be pejorative. The Type A is not the bad guy, and the Type B is not the good guy. If I had a committee of five, I would want at least two Type A individuals because of the Type A's alertness and intelligence. I would then be assured that the work would be done and done well. The problem is that the Type A works with such tremendous emotional overhead that he pays a heavy price, which is the increased incidence of heart disease.

Thus far I have said nothing to you about the Type B. I have merely implied that he is the converse of the Type A. He is easygoing, he does not gesture much, he listens to you, and he is pleasant. He may not be as colorful as the Type A. To the Type A the Type B seems sluggish, inert, apathetic and perhaps dull. The Type A cannot possibly conceive that the Type B can get things done in this world with his kind of lifestyle. It is for that reason I commenced a study of prominent Type B's in order to influence Type A's. The Type A is pretty smart and he is not going to be influenced by just any old Type B. Two months ago I had a unique opportunity to spend two days in residence with a senior senator, Alan Cranston, a junior-senior senator, S. I. Hayakawa, and with Senator Proxmire, with whom I have corresponded about this subject. I spent a half day with Dr. William McGill, president of Columbia University. We had a most stimulating time. I am working on the State Senate and on our Mayor. I am studying two spies, because spies are under a fascinating form of one-to-one stress. And notably, I have some intriguing tapes on my late good friend, Francis Gary Powers. I think I probably was the last one to interview him. So we will build up understanding of the Type B in order to use him as a role model for the Type A. Hopefully we can influence the Type A, because treatment of his disease is extremely difficult.

STRESS MANAGEMENT AT TRW

Samuel A. Shirley*

Before I talk about what we are doing at TRW in the area of stress management, I would like to tell you something about TRW defense and space systems group, to give you a background and a perspective. I think that is important because the environment we live in has a great number of stressors in it. There may not be more stressors than in any other environment, but certainly some are unique to ours.

First of all, we are in a high technology business. We are involved with large electronic systems, hardware and software. We are in major software programs, we do systems engineering for the Air Force and other government facilities on major systems that they have, and we design, build and fly unmanned spacecraft. We never get those spacecraft back, so they have to work the first time. We are in an increasingly competitive business. TRW and a couple of other companies were the forerunners in the advanced technology business. Now there are a lot of companies in the field. Everybody is getting very good at it so our competition is really tough right now.

There is increasing pressure from the customer with respect to cost and schedules. The day of the cost-plus contract is over. We are in increasingly difficult technological fields. The most recent example was the Viking biological instrument which, I am sure you are aware, was the instrument in the Viking Lander that went to Mars to see if there is a precursor of life on that planet. Not being a technical man myself, I went over to the program office one day when they were in the middle of this project. I asked what was going on and they said, "Well, so you can understand it, what we're doing is taking the equivalent of a university biological laboratory and reducing it to one foot cubed. We're packaging it. We're heating it and cooling it and putting it in a spacecraft that will transcend space and the environments and have a soft landing on Mars. Then a little arm has to come out and dig a bunch of soil, drop it in it, and that all has to work." And I said, "Okay," and went back to my office. Because I would not know where to start.

The reason for mentioning these projects is that the people who come to work here thrive on this sort of work, but they are also, I think, greatly stressed by it.

Finally, I think that generally it is harder to cope these days. Systems do not work anymore. I recently had the good fortune to go to Europe. I worked in Germany and then I went to France. One of the first things I did in Germany was miss the trolley out to the company I was to go to because I was three minutes late. In the United States the bus arrives plus or minus five minutes (or more) from its scheduled arrival. The rest of the ten days in Germany I did not miss the trolley! And I had a unique kind of calmness about me at that level which I did

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not realize until later. But one afternoon in the Hamburg airport I climbed on Air France and the next five days were insane. The airplane taxied around the airport twice, we were late taking off and within the next three hours my tension level was back up. And what I discovered at that point was that I had gotten very comfortable with an outside environmental system that was working. I think that is true of all of us today.

Internally at TRW there are tremendous pressures to stay technically current. Some of you who are in the technology field will know that given today's rapid technological advance, a person coming out of graduate school of a major university with a master's in the sciences or engineering is technically current for no more than three and a half to four years. That means if he does nothing else he is going to be obsolete in terms of next year's work. The pressure to stay technically current is tremendously high.

Again there is the cost and schedule problem--a shift from cost-plus to fixed price. We just won a multi-million dollar project--a five-year contract to build an unmanned spacecraft to be used by Western Union and NASA. We do not know what is going to happen in five years in terms of the economy and technology. But we bid a fixed price in terms of today's dollars. That is what our technical work force faces at TRW. Again, I am not saying this as "poor me!" But this is the stuff you sign up for and what happens to you when you go to work in a company like ours.

Finally, there have been a lot of new policies and procedures due to federal and state legislation which all of you are familiar with. As if that was not enough, about eighteen months ago we had a major reorganization!

About two or three years ago we began to see what we thought were products of this increasing stress in our system. There were more unexplained incidences in our high pressure programs at critical times. At the high vacuum test time, or the delivery time, or when perhaps the spacecraft would go from manufacturing into integration and test, there were more accidents. There were more antennas being broken or equipment being dropped. There was a rash of this sort of thing. We began to say, "Well, we've been pretty lucky up until now, and that's just what's going on." But it kept happening.

Secondly, there was a clear increase of referrals by our medical and industrial relations staff to physicians, psychiatrists and local agencies in the psychological field. We have had an ongoing program to facilitate and support employees getting psychological help in terms of dollars and time to see the doctors. This is covered in our major medical plan. But we began to see a marked increase in these kinds of incidences.

Thirdly, there was a kind of general dissatisfaction with the world. We do a great deal of what we call "employee sensing." We take a random sample of the employees, or cross-section of our work force in a unit, and we sit down and say: "Hey, what's it like to be in TRW today?" "What are the good things and what are the things you'd like changed?" We do that with a facilitator from industrial relations and also a key manager from that unit, so that the data is acted upon. In some of these sessions we began to see a growing kind of universal "ain't it awful!"--aint't-it-awful about affirmative action, you are not doing enough or you are doing too much; ain't-it-awful about inflation, you only gave us an "x" percent raise and the costs have gone up "x+" percent, and how do I keep five percent--a general dissatisfaction with the world. We have an internal grievance procedure in the company and the number of these grievances began to increase and

they were not around things that were very substantive. I do not mean that the people did not feel pain or that they were not agitated about something, but the grievances were about things that were hard to act on as: "I'd like my supervisor to stop picking on me!", "I'd like to not be discriminated against," "I'd like this-or-that." It wasn't "I want five more dollars!" or "I want to be promoted!" A general unrest was going on in the organization.

There was an increase in employee-supervisor requests for counseling. We do not have yet a formal counseling program at TRW, but we do have a lot of people in the work force, and particularly in the medical and industrial relations staff, with skills in a variety of counseling fields. And we found that as the word got out that we could do some of this, we got more and more requests. They were looking for ways to cope with supervisor-subordinate problems, they were looking for ways to cope with job pressures, with violated career expectations, with the fact that we were not growing at thirty percent a year anymore, so everybody is not going to get promoted and there was a flattening out in the organization. There were lots of tensions in the system, and people were beginning to ask for help. I think that is what is significant about that.

And finally, and most importantly, we began to get an increase in the number of voluntarily reported emotional-crisis incidents during working hours. "Voluntarily reported" are important words. Up to that point--two or three years ago--people would usually go to the medical staff and be referred outside. We now had people coming into personnel managers, industrial relations managers, and secretaries in the personnel offices with real full-blown emotional crises going on right then. A man would come into work and say to his supervisor, "I'm not going to talk to anybody this morning." Then he would go to his desk and sit down. Now the supervisor says to himself, "Wow! What do I do now?" An employee comes in from the parking lot and says to the guard, "I'm sure that most of the security officers, including you, are out to get me!" An employee comes into a personnel manager to ostensibly talk about career planning and halfway through the first fifteen minutes (this happened to be a woman) says, "Men are no goddamned good!" and begins to break down.

So we began to feel that something was going on here. There was not a lot of hard data and, scientifically, any of the incidents would not stand on its own. But put together, we felt we had a situation we had to deal with.

In terms of what to do, we had some ideas. Earlier we had done some work on a large career and personal counseling program which has not been implemented in the organization as yet. But that background was there. We decided, first of all, to train some of the inside people. We initiated a series of crisis-counseling training sessions with the industrial relations staff and the medical staff. Personnel managers, administrators, and medical people as well as the secretaries and non-exempt people who worked in those personnel management offices were included. The latter were included because a lot of times when a person in crisis comes in, the first desk he bumps into is that of a secretary. We did this for a couple of reasons. One was to increase the skills and lower the anxiety of the personnel people who had to deal with these problems as they had not had any previous training. Secondly, we did not really want to make these folks therapists. What we were really talking about was "emotional first aid." How do you get people in crisis grounded? How do you stabilize them? Whom do you ask for help and how do you get it? Thirdly, we wanted to provide a data base of services in the community that our personnel and medical staff could use to refer people to. And finally we wanted to create for the industrial relations staff

a support system for themselves so that they could sit down and begin to talk about the "cases" they were involved with. If we had not had the crisis-intervention training, two personnel managers from two different divisions would not have known that the crises they were working on were one and the same--a man and woman who allegedly were having problems at home and came to these two personnel managers independently. The interventions of those two personnel managers were quite different the minute that they knew they had a connection. The managers not only had a support system between the two of them and the rest of us, but they also did some different things because they knew what the other parties were doing. So there was some synergy in that situation.

Secondly, we decided to try to increase the population's general awareness of stress and what you can do about it. We did that in a number of simple ways and are still doing it. We gathered reading material and passed it out. That little booklet from Blue Cross, *STRESS*, is a very good basic book on stress and stress management. We have put on a couple of colloquia at TRW on stress management. We had about five or six hundred people attend, which means that stress is an interesting subject to the work force. We promoted attendance at conferences such as this one and some of our line managers began to go.

Thirdly, in addition to training and increasing awareness, we wanted to get some management attention on the problem. So in our supervisory training we began to talk to first-level supervisors about what a crisis is and what emotional upheaval is. We told them that when a crisis happens in front of them at their workplace, things are not really coming unglued, but somebody is in trouble, in pain. The managers had to be aware of it, needed to care, and needed to try to get help. We tried to show them where some help was available in the industrial relations staff.

In our middle management program, basic management development and our project management program, we have included a module on stress. We have done some of the things we are doing here today, including relaxing techniques. We try to make our managers aware that, yes, they are managing a fifty million dollar spacecraft with all its complexity but the people who are carrying out the work are under tremendous stress trying to meet the cost, schedule, and all the technological needs of that program. And we give them simple kinds of information, such as, if somebody on your key team has had two major things happen to them in their life recently, you can bet he is in some kind of stress, and you can bet the stress will manifest itself on the job. So if you have someone in that situation, think first before you put him on a thirty-five or forty hour vacuum test. You may want to reassign him, you may want to postpone the test, or do something else. But you must be aware of what is going on.

In the education area we are planning within the next few months to begin a course which is going to be conducted by one of our project managers. This is great as far as we are concerned because then it's not the industrial relations guy coming down the line with a new program. Instead it is a highly respected manager who is running a major spacecraft program who is going to conduct a ten-week course in stress management. We are going to offer it in our after-hours program. Additionally, we are going to offer some relaxation techniques workshops in which we will use biofeedback, meditation exercises and other methods to make people aware of the need to take time to relax. So, our strategy in this whole area then is to start slowly and keep it small until we get a better idea of what we are doing! Because right now we do not know what we do not know about this whole field. I

am convinced of this lack of knowledge generally and I know it is true in TRW. We have many more questions than answers. In fact, some of the feedback from our colloquia was, "the presenters were great but you violated my expectations because you didn't tell me how to manage my stress. You just didn't tell me all the things I need to know when I feel stress." We need to understand what our employees' expectations are.

We need to keep a focus on the following things. You cannot eliminate stress, it is going to be with us. Secondly, you can reduce some of its sources by knowing what causes it and plan accordingly. As an example, if you know a guy is under a lot of stress, you do not put him on a critical test. You get somebody else. You encourage people to talk about their stress and get help. It has only been in the last couple of years that the general population has accepted psychiatry or therapy for the normal and not seen it as a remedial "I'm-terribly-sick" kind of a phenomenon. People are now going to therapists and others just to build their strengths and skills. We want to keep that tendency at TRW going and we tell our employees "It's okay to ask for help if you're in pain, and if you think you need it." And finally we want supervision to be sensitive to stress and caring about its employees. These are the kinds of things I am interested in promoting right now.

Now, as far as the future is concerned, I am excited about a number of things. One of the things I think we ought to do is to expand on what we now know. We have some glimmerings of some of the things that work and I think that over time we are going to broaden the scope of those things. What I think we are going to add in the next few years is probably crisis intervention training for supervisors. I am becoming more and more convinced that that is where the action is. All the crises do not happen in the personnel manager's office--they happen right in front of you. So if we somehow give the supervisors some more training--not to change their primary job of supervising the work that needs to be done--but to add a dimension to that job which says, "Here are some tools, and part of your responsibility is to have to deal with this, whether you like it or not!"

Secondly, I think more energy of mine--and some others whom I can coerce into it--is needed in the career and personal counseling field. I think that in ten years most major companies will have some kind of career-personal counseling service offered to its employees in some way. I hate to have to wait ten years--I think we ought to be doing it now. But I have not yet been able to convince everybody I need to on that score.

Thirdly, we are going to continue to do some things like personal worth workshops. One that we are planning this next year is a life transition workshop. I think a lot of the stress we get, whether you go into a work place or not, has to do with how we live our lives these days and what the transitions are. For instance, people come up closer to retirement and they are not ready to quit. The work force tends to get younger, not older, in terms of spirit and physical condition. I think we need to be looking in those areas.

I have given you a sense of our program. You will not find a director of stress management at TRW. You are not going to find a manager of crisis. There are a number of us who have been together in this whole effort and we are still moving. We think we have got something substantive which is going to emerge and evolve. We want to continue to develop an awareness of the subject of stress and secondly, develop methods and tools for people, supervisors as well as the employees, to

cope with it. And finally I think we need to continue to do the research and the questioning--we need to get smarter. I think that is what we are doing here today--sharing information. I am fascinated by some of the information I have heard here today.

I appreciate being able to come here and tell you something about my excitement and what we are doing at TRW.

THE STRESS REDUCTION PROGRAM AT UNIVERSITY HOSPITAL UNIVERSITY OF CALIFORNIA MEDICAL CENTER, SAN DIEGO

Jenny Steinmetz, Ph.D.*

I've been education coordinator at the hospital for nine years. I was hired originally for "be nice" training, that is, to teach the staff how to be nice to the patients. We have had a lot of "be nice" programs. We have had team building, and we have had retreats. We have had programs on "What are the problems of patients coming into a university hospital?", ethnic encounters, and so on. But about three years ago, one of the administrators came to me and said, "We're still getting complaints about some of our staff. In the outpatient department and the emergency rooms, the staff is being hostile to patients." Then we decided to take a hard look at what we had been doing, and see if we could not develop a better model.

My background is in psychology. Clinically, I use a multi-modal approach for therapy. It seemed a good idea to take some of those clinical approaches and try to apply them to our staff. I do not want to give you the idea that I am talking about therapy for the staff. I am talking about some of the kinds of measures you could use with a normal population. We have administered a personality test for normals, the COMREY Personality Scale, to our staff. We find that they are supernormal. They are more emotionally stable than the general population, even though they are stressed. So there is nothing wrong with them, except what their job is doing to them.

Rather than going to them and telling them again how to behave and have them build up some trust in each other, we decided to get them to tell us what the stressors were that they were trying to face, how they expressed the stress physiologically, what they were doing about the stress, and how they would like to be. In other words, instead of making an assumption that the staff is a nasty group that enjoys being nasty to our lovely, attractive patients, we made the assumption that they are decent people who want to do a good job. Because of the stressors and the kinds of environments they worked in, they really had a hard time. So we changed our approach and our seminars. I would like to describe our model which is constantly evolving.

Almost all of our work is group oriented. The groups are either from one working group which has the largest generalizability back at their work place, or from an open group that anybody can attend. Our groups rarely run more than eighteen or twenty members. We try to have two facilitators working with the group. In other words, we try to do pretty intensive work, although the group meets once a week for two hours over a six-week period.

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We have developed a work-stress questionnaire. (See pages 64 and 65 .) Essentially we are interested in the employees' job classification, how long they have been with us, educational level, age, and marital status, sex, and their religious background. Then we want to know what kind of stress symptoms they are experiencing on the job and what kind of measures they are using now to relax. We list common stressful working conditions and ask them to indicate how often each source of stress is true for them. While we may not use this particular questionnaire with all groups, we will use one similar, so that for each group we have an idea of the common stressors.

I would like to describe some of the feedback we have gotten from the questionnaire and then describe our program.

We find three categories of stressors--physical, social and cognitive. For instance, two of the greatest stressors for our operating room personnel is that we have no windows there, which really bothers them. Secondly, the personnel cannot leave the work area. There's no way they can walk off, relieve their stress, and come back. These are two big physical stresses. As for social stressors, a number of our staff report they have difficulty working with aggresive people; aggressive people really bowl them over. They report they have a hard time giving negative feedback to other people. They have almost as hard a time receiving it themselves. There are many interpersonal things that take place both at work and outside of work. It's not just that the work situation is stressful but that our employees are also trying to live up to a number of roles--the perfect wife, the perfect nurse, the perfect mother, etc. The totality of that is very stressful. Most of us who are working females know why.

We have another stressed group for which we have begun to develop a program, that is, campus management. For this group, organizational conflicts add to stress. I have a notion that a lot of stressful conflicts begin as relatively simple, little conflicts. Take for instance, the small conflicts between the administrators and the academics. It's a fearful job. The academician will say to the administrator, "You're always bugging me to get the data in!" "You're always telling me I won't get my grant if I don't have everything down right, line by line. Come on, you can take care of that stuff!" And the administrator says, "You guys, you don't know what our job is like!" In those kinds of conflicts, it doesn't make much difference who the individuals are in the particular positions. Those role conflicts I do think become personalized similar to social conflicts.

So, physical, social and organizational stressors, these are the three areas of environmental stressors that we are presently working on.

Now let's discuss the cognitive stressors. Most of us have a pretty good B-rated movie going on in our head all the time. We do not like to tell other people about it very much, but our script and the way we interpret events really affects us. I can think of an example. About 12:15 today I felt myself starting to get a little uptight. I realized that it was because the morning program was running over and might affect the afternoon program, when I was to speak. I could react in one of two ways. One was to say to myself, "Those research chauvinists! Do they think that what they have to say is so much more important than my stuff this afternoon?" Then I would have gotten uptight and would have tuned out and not listened to anything else. The other choice I had was to go with the flow and say, "Hey! That's pretty interesting and something will work out this after-

noon." With each choice the effect on me is very different. Given the same experience, the way I interpret it affects my physiological stress. In other words, I can get really uptight all by myself without anything else going on. I can sit in a room, start thinking and brooding, and run my B-rated movie forwards and backwards. I could really do a number on myself.

We are also interested in the physiological stress, how people feel their stress. Our most popular way of feeling at the hospital is the tensing of the neck and shoulders, and we have a lot of people looking like turtles by the afternoon. One of the goals of our program is to make our employees leave less tense and protect us on the highways. Secondly, maybe they will be able to enjoy their time when they are not at work. Also it is very difficult to work like this, in this tense state.

Headaches are common symptoms and some people really feel stress in their stomachs. Now we are making the assumption that this physiological stress causes you to perform poorly. Also you do not take in new information as well. Your whole system does not work as well, you do not remember as well. When people are talking to you when you are uptight, you might not be grasping what they are saying to you. When they ask you for information you often cannot give it.

The most graphic example that I have experienced was being a little late, going a little too fast, being under a little time pressure and then having all those nice flashing red lights behind me. I pulled over and this very nice gentleman came alongside saying, "What's your name?" I knew I knew it. It was just one of those things that, just as soon as I was relaxed, I could think of.

I think back to when I took examinations. You go in for the exam. You sit down and start writing and you draw a blank. Finally you leave at the end of the time, you walk out in the hall, you do not talk to anybody, nothing happens, but some of the material comes to you. It was always there. You just could not get to it.

When we are physiologically stressed we do not perform as well. We get clumsy. How do we feel when we do not perform as well as we could? More negative self-talk: "I blew it today." "Here I go again!" That is bad enough. But when you do not perform as well as you can, you become an environmental stressor to other people around you. So that at any given time you can get a whole bunch of these cycles going on concurrently.

Working with a group, depending on the results we get on the questionnaire, we fill them in on what appear to be environmental and cognitive stressors, and how they express stress physiologically and behaviorally. Some weeks crying is popular, other weeks we have people who are defensive and are getting angry--according to their own reports.

After we have assessed with a group what seem to be common problems and what seem to be more idiosyncratic problems, we start to introduce some of the interventions, or ways we hope to break into the stress cycle. And we present these interventions to the group as if they were going into a clothing store. There's a wide choice of things they can try on to see what fits them, what is comfortable to them, what seems to suit their style. They can take an approach away and use it. If it doesn't seem right just then, at least they know it is in the store. If they want to come back in and try it on later, they can do that.

So first for the environmental stressors, we have a couple of ways we deal with these. One way is the use of active listening. We have gotten so used to using the technique as psychologists that we never thought about passing it on to somebody else. I do not think that hospital personnel can go through the day just doing a lot of active listening, saying, "sounds like you're angry," "sounds like you're upset," "sounds like...," "sounds like...." But we allow them two uses per day. Psychologists are the only ones who can do it all day and get paid for it. But it is a good skill to pass on to people to keep them from getting caught up in other people's anger, anxiety and all of that kind of negative energy stuff that is around.

The second technique we use is assertion training. We have found that a lot of people have kept so much anger in themselves. They are afraid to start letting it out because they are afraid they are going to go from passivity to real aggression, and not know how to stop in the middle. So we do a lot of assertion training which turns out to be very important.

A third thing that we do is work on belief systems. We call that cognitive restructuring. It is sort of a "roto-rooter" of the mind, flushing out all those bad beliefs and replacing them with something that seems to be more helpful.

And then the fourth, and probably one of the more important techniques, is some relaxation training. When we do it in small groups we use biofeedback, which another speaker will be discussing later. In most of the hospital groups though, we use the Jacobson somatogenic training and we get to progressively shorter kinds of training so that people can do it in the times that they are in the bathroom or sitting down at their desk for a minute or two. In that line of thinking, we also do a bit where you put a small piece of tape on your wristwatch and one on your phone. When your phone rings you do not answer it until the second ring. On the first ring you take a slow, deep breath, and the tape is a reminder. Every time you look at your watch and see that other little piece of tape you also take a slow, deep breath to stop you in your tracks for just a second. That has turned out to be effective--in fact, we are running out of tape! People put the tape wherever they need them--the phone and wristwatch seem to be two of the most effective places.

Let me review the techniques in terms of the strategies. The active listening is used primarily to help people stay out of other people's craziness. It turns out to be a very easy technique to learn and is something to do instead of immediately getting defensive and uptight. So, when somebody comes to you and says,"Goddammit, this is the worst ward in the whole unit!" you do not say, "Well, whaddya expect? We have poor leadership!" You say something like, "Hey, you really sound angry." Some people are afraid that if they do that the person will get madder. Consider the alternative. If they get madder and say, "You're goddamned right I'm angry!" then the answer is "Just checking it out." In other words, if one person has lost his cool, there is no point in a second person doing it too. It does not lead anywhere.

Another objective we have is to try to de-personalize these kinds of blowups and turn them into problems to be solved rather than personality issues. Teaching people to stand back and check things out first before they start reacting and tensing all the time is really important. And we have had some really nice successes. We had one nurse that was actually called out of one of our sessions by a very irate physician. I do not want to imply that only physicians become

irate--everybody's capable of it, he just happened to be at this point. First of all he was irate because the nurse was at one of those fuzzy things--a meeting where people talk about their problems--instead of being where she should have been. She should have been at her work place, where he was, and where he could not find a piece of equipment. So he blew his top and she remained silent. Finally she said on the phone, "You really sound angry." And there was a large pause. And he said, "I was, I am not now." And then she told him where the equipment was and that was the end of it.

But formerly they had this little automatic pilot number going where he would blow his top and then she would start saying, "I'm sorry, I know I shouldn't be here!" and then he would say "Your place is right here!" and they would go on and on.

So just being able to stop sometimes, take a deep breath and give some feedback to the other person about how you see them coming on, with the idea that you may be wrong. And if I say, "Hey, you sound angry," and they say,with their lips clenched, "I'm not angry!" I say, "That's really great! I'm glad." Take whatever they say at face value because there are a lot of people who do not want to appear angry. So, help them out.

Some people worry about these techniques seeming mechanistic, or planned. Then we talk to them about the alternative. "You mean you like it better when you lose your cool and scream because you didn't plan it that way?" That thought helps to turn their heads around.

That technique alone is not enough. Problems generally are not solved by just sitting there and saying "It sounds like...." So we spend quite a bit of time on assertion training. One of the things we found was that we have a lot of people who consider themselves passive, or who have been considered by other people to be passive. Table 1 describes three categories of behavior styles: passive, assertive, and aggressive. Well, I used to have the category passive-submissive but dropped it because I have not found any. I am really interested in this. I have yet to talk in depth with a passive person who is not very angry. We have a term we use called "gunnysacking." What happens is that you feel you are the office "go-for." That is how you can tell who the passive person in the office is--"Well, my secretary is not here today, would you mind going for the mail?" "No, I wouldn't mind, that's what I'm here for!" On your lunch break, "Would you mind running an errand for me?" "No, I'd just be delighted!" "Would you mind sharpening all the pencils, they seem to be dull?" "That's fine!" "We're having a meeting, get the coffee Marge!" "Love to!"

What we find is that when the passive person finally blew, the people around her were usually saying, depending on her age, "It must be that time of the month!" or "She's forty-something, isn't she?" or else, "She must be having trouble at home." The source of the problem really was not being looked at. One of the reasons for the anger in the passive person is that they are really angry at themselves because they had never said, "Hey, it's not fair!"

One of the groups that we found had the most stress was medical secretaries. They have a belief system and a method of self-talk which is, "I should be able to handle anything that comes across my desk, but at the same time other people should realize that they are piling it on." They never say to anybody "Too much!" or "Let's reassess the priorities." or "I can't handle it."

Table 1

COMPARISON OF ALTERNATIVE BEHAVIOR STYLES

	PASSIVE	ASSERTIVE	AGGRESSIVE
CHARACTERISTICS	Allow other to choose for you. Emotionally dishonest. Indirect, self-denying, Inhibited, Win-Lose Situation which you lose. If you do get your own way, it is indirect.	Choose for self. Appropriately honest. Direct, self-respecting, self-expressing, straightforward Convert Win-Lose to Win-Win.	Choose for others. Inappropriately honest (tactless) Direct, self-enhancing. Self expressive derogatory. Win-Lose situation which you win.
YOUR OWN FEELINGS ON THE EXCHANGE	Anxious, ignored, helpless, manipulated. Angry at self and/or other.	Confident, self-respecting, goal oriented, valued. Later: accomplished.	Righteous, superior, Depreciatory, controlling Later: possibly guilty.
OTHERS' FEELINGS IN THE EXCHANGE	Guilty or superior. Frustrated with you.	Valued, respected	Humiliated, defensive, resentful, hurt.
OTHERS' VIEW OF YOU IN THE EXCHANGE	Lack of respect. Distrust. Can be considered a push-over. Do not know where you stand.	Respect, trust, know where you stand.	Vengeful, angry, distrust, fear.
OUTCOME	Others achieve their goals at your expense. Your rights violated.	Outcome determined by above-board negotiation. Yours and others rights respected.	You achieve your goal at other's expense. Your rights upheld; others violated.
UNDERLYING BELIEF SYSTEM	I should never make anyone uncomfortable or displeased .....except myself	I have a responsibility to protect my own rights, and I respect others but not necessarily their behavior	I have to put others down in order to protect myself.

NOTES:

So in assertion training we teach people how to express what their needs are. They may not get them met, but they can express them so that if they are not met they cannot blame someone else for not guessing what they are. We teach people to express how they feel about things. We essentially try to teach them how to problem-solve. Instead of ignoring a problem we teach them to go to somebody and say, "Hey, you know I'm really feeling frustrated because it doesn't seem to me that we're getting this thing done as well as we can. What can we do about it?" We do a lot of role playing and we do a lot of videotaping. That is the one time we break the group up. Often we will have them come in, two at a time, for an hour and videotape, playback, videotape, playback until they are satisfied with what they are doing. The one time when we do it in a group is when we teach them crowd control. That is needed when their sick kid is calling from home at the same time a patient is ringing the buzzer at the same time somebody needs some orders done, at the same time that.... Then we have the whole group convene and work on that.

The way that we get at the cognitive restructuring is to have them talk about their role myths. If they are a house staff member, they talk about what is the myth about the perfect house staff member. If they are a head nurse, they talk about the perfect head nurse myth. If they are working in the kitchen, they talk about what is the myth about that job. And they come up with what they think the expectations are for them, very similar to what Warren Schmidt was talking about earlier. Then we talk about how much they have bought into or believe those myths. It turns out that most of us have bought into that pretty heavily. There is the myth of the perfect psychologist who never has any personal problems, is always ready for a client whenever he wants to call, and is always pleasant and accommodating. If I am once not one of the foregoing, you know what that means--I am not a good psychologist. Every profession has those kinds of role myths, those kinds of belief systems. So we try to tap into those role myths for each job.

Another way we get at that is to take Albert Ellis' "Ten Irrational Beliefs" and getting them to list all the things that are wrong with each of those. And that can be very difficult. Take the belief, "If everybody doesn't like me all of the time, then I'm not any good." People say, "Well, that's silly!" "O.K., tell me what's wrong with it." And there's a long silence. Most of us operate out of those beliefs more than we would like to admit. It is all part of our B-rated movie. So we work on that.

And then the last part of training is various kinds of relaxation. I will describe some of the methods very briefly.

Probably, the best one to start with is the Jacobson method. One of the best tapes, and this is only a personal preference, is the one by Lazarus from South Africa. (And it is just because I like his voice.) The Jacobson method has you progressively tense and then relax muscle groups. There are two purposes--one being to find the areas where you may normally express stress but perhaps do not realize it. For instance, we have had people who did not realize how much tension they carry in their neck until they started doing the exercise. Then they said, "Ouch! That feels familiar!" When they tried to relax those muscles, it really hurt. The second purpose is to have you learn that you can relax muscle groups more fully by first stressing them more.

A second relaxation method that we usually use the second week is autogenic train-

ing. We get people to think of scenes that they have experienced, or words--for some people one is better than the other. For some people, inhaling while saying "I am" and then just saying the word "relaxed" on the exhale will produce relaxation. One of my favorite computer operators has to think of a black blackboard which is wetwashed--it cannot be erased, it has to be wetwashed--so that it is completely black. Everybody has to do their own thing. You can use a mantra; the word "one" is very effective. We have found that that is just as effective for most people as Transcendental Meditation, if they use an amount of time equal to TM training.

As a short exercise, I suggest you try to:

(1) Close your eyes.

(2) Count backwards from ten.

(3) Inhale on each count, saying to yourself, "I am."

(4) Exhale on each count, saying, "Calm."

P.S. Please read through before closing eyes!

Please put a mark identifiable to yourself only in this box.

CONFLICT/STRESS QUESTIONNAIRE

I. Please complete the following questionnaire by writing in answers or checking the appropriate space. The demographic data will be used in conjunction with the responses on the stress questionnaires to look for factors which differentiate amounts or types of stress. Since these are anonymous questionnaires, we appreciate your answering these questions in the most honest manner possible.

II. Job classification _____

Length of time in University _____ University location _____

Age _____ Marital Status _____ Sex _____ Highest educational level attained _____

III. What stress symptoms have you experienced on the job?

	Never	Rarely	Sometimes	Often	Always
Headaches	1	2	3	4	5
Stomach aches or tension	1	2	3	4	5
Backaches	1	2	3	4	5
Stiffness in the neck and shoulders	1	2	3	4	5
Elevated blood pressure	1	2	3	4	5
Fatigue	1	2	3	4	5
Crying	1	2	3	4	5
Forgetfulness	1	2	3	4	5
Yelling	1	2	3	4	5
Blaming	1	2	3	4	5
Bossiness	1	2	3	4	5
Compulsive eating	1	2	3	4	5
Worrying	1	2	3	4	5
Depression	1	2	3	4	5
Agitation	1	2	3	4	5
Impatience	1	2	3	4	5
Anger	1	2	3	4	5
Frustration	1	2	3	4	5
Loneliness	1	2	3	4	5
Powerlessness	1	2	3	4	5
Inflexibility	1	2	3	4	5
Compulsive smoking	1	2	3	4	5

IV. How often do you use these measures to relax?

	Never	Rarely	Sometimes	Often	Always
Take aspirin	1	2	3	4	5
Use tranquilizers or other medication	1	2	3	4	5
Drink coffee, coke, or eat frequently	1	2	3	4	5
Use relaxation techniques (meditation, yoga)	1	2	3	4	5
Use informal relaxation techniques, (i.e., take time out for deep breathing, imagining pleasant scenes)	1	2	3	4	5
Exercise	1	2	3	4	5
Talk to someone you know	1	2	3	4	5
Leave your work area and go somewhere (time out, sick days, lunch away from your organization, etc.)	1	2	3	4	5
Smoke	1	2	3	4	5
Use Humor	1	2	3	4	5
Have a drink after work to relax	1	2	3	4	5
Other	1	2	3	4	5

UNDERSTANDING AND MANAGING STRESS

Stressful Work Conditions

V. There frequently are day to day conditions at work which we find stressful. On the items below, indicate how often each source of stress is true for you by circling the appropriate number.

	Never	Rarely	Sometimes	Often	Always
1. Others I work with seem unclear about what my job is	1	2	3	4	5
2. I have differences of opinion with my superiors	1	2	3	4	5
3. Others' demands for my time at work are in conflict with each other	1	2	3	4	5
4. I lack confidence in "management"	1	2	3	4	5
5. "Management" expects me to interrupt my work for new priorities	1	2	3	4	5
6. There is conflict between my unit and others it must work with	1	2	3	4	5
7. I only get feedback when my performance is unsatisfactory	1	2	3	4	5
8. Decisions or changes which affect me are made "above" without my knowledge or involvement	1	2	3	4	5
9. I have too much to do and too little time to do it	1	2	3	4	5
10. I feel over qualified for the work I actually do	1	2	3	4	5
11. I feel under qualified for the work I actually do	1	2	3	4	5
12. The people I work closely with are trained in a different field than mine	1	2	3	4	5
13. I must go to other departments to get my job done	1	2	3	4	5
14. I have unsettled conflicts with people in my department	1	2	3	4	5
15. I have unsettled conflicts with other departments	1	2	3	4	5
16. I get little personal support from the people I work with	1	2	3	4	5
17. I spend my time "fighting fires" rather than working to a plan	1	2	3	4	5
18. Management misunderstands the real needs of my department in the organization	1	2	3	4	5
19. I feel family pressure about long hours, weekend work, etc.	1	2	3	4	5
20. Self-imposed demand to meet scheduled deadlines	1	2	3	4	5
21. I have difficulty giving negative feedback to peers	1	2	3	4	5
22. I have difficulty giving negative feedback to subordinates	1	2	3	4	5
23. I have difficulty in dealing with aggressive people	1	2	3	4	5
24. I have difficulty dealing with passive people	1	2	3	4	5
25. Overlapping responsibilities cause me problems	1	2	3	4	5
26. I am uncomfortable arbitrating a conflict among my peers	1	2	3	4	5
27. I am uncomfortable arbitrating a conflict among my subordinates	1	2	3	4	5
28. Academic and administrative roles are in conflict	1	2	3	4	5
29. I avoid conflicts with peers	1	2	3	4	5
30. I avoid conflicts with superiors	1	2	3	4	5
31. I avoid conflicts with subordinates	1	2	3	4	5
32. Allocation of resources generates conflict in my organization	1	2	3	4	5
33. I experience frustration with conflicting procedures	1	2	3	4	5
34. My personal needs are in conflict with the organization	1	2	3	4	5
35. My professional expertise contradicts organizational practice	1	2	3	4	5
36. Administrative policies inhibit getting the job done	1	2	3	4	5
37. Other	1	2	3	4	5

Number Circled

A UNIQUE APPROACH TO STRESS REDUCTION: APPLICATION OF BIOFEEDBACK

Robert L. Jordan, M.D.*

My work primarily deals with stress on a one-to-one basis as a counselor and psychotherapist. Biofeedback is something I have used to help in my stress management for the last five or six years. I find it an interesting and delightful method of working with people, and I think it is quite helpful in an educational sense. I am not making any claims for it as a cure-all or an electronic guru. It will not create nirvana; it will not solve ingrown toenails. But it does do some very interesting things for you in the way of learning how to monitor and regulate some of your own body functions. The term "biofeedback" is new. It was coined in 1969 by a group of biofeedback research people who met to establish a society. (You cannot have an organization without a society and you cannot have a society without a name.) We even have a California Biofeedback Society now and are giving examinations for people who learn to operate the equipment.

The easiest way to describe biofeedback is to tell you precisely what it does. Biofeedback is a technique. You use equipment, but it is a technique. "Bio," as we use it, refers to any life function of the body, whether it is the heartbeat, the breathing, the blood flow, the activity of the intestinal tract, the temperature of the skin or any other physiological or life function. Using biofeedback we monitor those functions.

The monitoring process tells us what is going on with regard to that particular function. If we take the function, for example, of the heartbeat, we have to have a way of telling us what is going on in order to monitor it. The five senses are used as monitors. So we could hear a heartbeat if we had good enough hearing. But since we usually cannot hear it on our own, we use a biofeedback device. There are all kinds of biofeedback devices and essentially these are just electronic instruments which amplify the signal we get from our own body function. In this case we use an amplified stethoscope. So with an amplified stethoscope you can hear the heartbeat. You can hear how fast it is, how slow it is, or whether it changes its rate, so you can tell what is going on. That heartbeat is fed back to you through one of your senses, your hearing, and it goes to your brain/mind and there you do something about it. In order to complete the cycle in biofeedback you take a specific life function--like the heartbeat--you monitor it, you see it, you find some way to tell what it is, and then you change it.

Now this sounds kind of strange and mysterious--to change your heart rate. But it is not really that difficult. The things we have done with biofeedback for a long time are just automatic. For example, a baby learns to eat. It does not know right away how to get the food in its mouth. He takes a handful of food

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and makes a pass at his mouth--it may get to the ear or the nose or the eye. But after a while, that feedback device--seeing the arm, seeing the hand there with the food, tasting it, perceiving it when it gets to the mouth--tells what is going on. So that baby learns how to hit his mouth with his fist after a while. Now it is really that simple in the sense of the process. The body, of course, is very complex physiologically and chemically and biologically and it is not simple in that sense. But we can sense what is going on.

For example, we can just look at our skin and tell whether it is light or red or white, whether it is rough or smooth. We can tell a lot of things just by looking. If we want to amplify that looking procedure we can, for example, hook up an electronic thermometer that has a gauge or a dial on it. We can look at that dial and we can tell what our temperature is. So we feed it back that way. We can look in a mirror, we can see what happens to our facial muscles and our expression--that is feedback. We hold the mirror up, we see we are frowning, so we change our expression--we smile. That is feedback. The muscle-maneuvering of the frown was the life function, we monitored it by looking in the mirror and then changed it with our mind, our will, and whatever devices we can find that cause these things to happen.

So we choose our body function: heart, intestinal tract, blood flow, skin temperature--whatever biological or physiological process we want to monitor. We find ways to monitor it by amplifying it, enlarging it, making it accessible to our sense organs, so we can tell what is going on immediately and continuously. Then we set about to change what is happening in our body. I would like to tell you about some of the extremes.

In some of the earlier research, for example, they were working with rats, and they could get the rat to make one ear white with no blood and one ear red, full of blood--relatively speaking. So they could train this rat with biofeedback--flushed in one ear and blanched in the other. Some of the swamis have been doing things that are quite remarkable with human temperature. For example, Swami Ramma could take probes on the palm of his hand and get a ten degree temperature difference in an area two inches apart, and then he could reverse it. He could warm one hand and make the other one cold and switch. These are things that can be done with the body by people who have had a lot of practice. We do not expect to do all that. But we do expect to do some things that are very helpful in our problem of dealing with stress.

We use biofeedback in my office primarily to deal with psychosomatic disorders. Now there are two fundamentals we keep in mind in biofeedback. One is that any body function that we can monitor, we can change. The second thing we keep in mind is that any physiological change in our body is accompanied by some emotional or mental change. And, conversely, any emotional or mental change is accompanied by a physiological change. We talked about some of those things this morning. So when we deal with what we call psychosomatic disorders, we are dealing with both the mental and physiological manifestations. It has been said that at least three-fourths of all patients that go to the doctor's office have what we call a psychosomatic disorder. This does not necessarily mean that there is something inherently wrong with the body; it means it is out of balance and there are symptoms. These physiological changes in the body have been created at least in part by changes in the thinking--worry, fear, anxiety, tension. The muscles get uptight, you get ulcers, you get high blood pressure, you get neurodermatitis, colitis, migraine headaches and tension headaches. All of these things are what

we call psychosomotatic disorders, as we are using it here. These are the kinds of thing I treat with biofeedback in my office.

What we do first is identify what the symptoms are. We talk a little bit about what the emotional concommitants are and how the emotions are related to what is happening in the physical body. Then we show the patients how they can change that. Our usual procedure is to have the patient sit in a relaxed way in a comfortable chair, in a room that is quiet and fairly dark, where there are not many outside stimuli. We give him different relaxation methods, such as the Jacobson Progressive Relaxation Autogenic Training, to help get total body relaxation. Then we use the biofeedback equipment to focus on a particular part of the body. This is one of the differences between biofeedback training and general relaxation techniques.

You can get some generalized relaxation with biofeedback but it is primarily a specific modality, it deals with a specific body function. For example, a person comes in with high blood pressure. We can put on the blood pressure cuff and measure the blood pressure. If you have a sophisticated enough cuff it gives you a retrogressive reading. The patient can tell as he is going through different relaxation procedures what is happening to his blood pressure. Many times just generalized relaxation is not enough. We can get people quite relaxed. It relieves a lot of tensions and balances out a lot of their physiology and their autonomic nervous system, but it does not necessarily relieve some of these target organ symptoms such as blood pressure and ulcers.

As an example, let's use colitis where the intestinal tract is working too fast, too hard and the patient has cramps, diarrhea, discomfort; a body imbalance. So we use our generalized relaxation methods, then we use an amplified stethoscope so the patient can hear the gurgling and the growling of his intestinal tract. As he practices the techniques that we give him, and as he develops methods of his own through his thoughts, visualization, and any other mental technique that he can find, he begins to hear that his intestinal track calms down. As it calms down, he realizes what it was that he did that caused it to calm down. This is the learning procedure in biofeedback. It sounds strange and mysterious but it really does work. You really can control anything that you can monitor. Our equipment is not sophisticated enough to monitor everything, we do not have enough techniques yet to change everything, but we have enough practice and experience to know that our mind and will are so powerful that we really can change anything that goes on in our body. So that is the basis for treating psychosomatic disorders with biofeedback.

What we are talking about here today, generally, are not psychosomatic disorders. Those come after prolonged or chronic stress. What we are talking about is the stress we experience before we get psychosomatic disorders. We are dealing with the tensions that come along before the colitis, the tensions that come along before the heart attack. So now we must translate the biofeedback application to generalized stress. This is still experimental; as a matter of fact the whole field of biofeedback is experimental. There is a lot to learn but I think there is a lot of potential for its use. However, there are still a lot of things we need to develop before biofeedback is really applicable to group modification of stress. One of the things I have done in my office, and which we have done at TRW, is have pilot programs of groups of people working together, say with a temperature monitor on migraine headaches. Each individual had his own instruments but they all worked together. We used relaxation methods, biofeedback

methods, a little bit of group counseling and we got what we felt were excellent results in teaching people to abort or prevent their migraine headaches in a relatively short time. Migraine headaches are just one manifestation of tension and anxiety. There are lots of others. There may be an infinite number of possibilities for the application of biofeedback. We have only dealt with a few of them.

I think there is a big future for techniques like biofeedback. Essentially our educational devices help each one of us, as individuals, learn to take care of our own body tensions and symptoms.

We are not usually aware of what is going on in our body when we are having these tensions. We know a little bit about it; if we have hunched-up shoulders we might know what is going on. But we do not usually know if our blood pressure is up. We do not always know when we are having tensions in our stomach, until there is an ulcer. We really do not know a lot of things that are going on when stress is mild or moderate. One of the things that we can do with biofeedback is to teach people to recognize these stress signals. If we use an amplified stethoscope to listen to the intestinal sounds, after a while we begin to recognize what it feels like when the contractions are greater and what it feels like when they are lesser. If we hook up a monitor to muscles, we begin to realize what is really a relaxed muscle. Most people do not know that. Most people do not have really relaxed muscles. We put them on the machine, they watch the gauge and get the muscles really relaxed and they then know what that feels like. So the next time they get a tension, a pressure in those muscles, they recognize it. We are teaching people to recognize from their own body signals what is going on within them, giving them an awareness of their own physiology, an awareness of their own emotions, an awareness of their own life functions. And to me that is critical. When you are aware of a change, you can do something about it! You do not have to take pills. You are dealing with your own body, with your own life. You have a tool then that you can use to help you to recognize and do something about the tensions that are going on in your own life. It is not easy, and the technique is not perfected.

You have to practice and you have to keep doing it. But once you begin to recognize what those tensions are, and you begin to do something about it when you recognize them, it gets easier and easier. After a while, instead of taking fifteen minutes to sit down and relax, you do it almost automatically. You give yourself key words and key signals. You feel you are uptight, you notice it, you give the word and you relax. So it becomes an almost automatic regulating procedure.

Biofeedback is a learning device that helps us to recognize the clues and the signals that go on within all of us. We have the method of recognizing the signals and the method of changing those stresses. We learn how to get some relaxation, how to relieve some of those symptoms, so we can be healthier. I try to help people realize that stress is here to stay. It has always been around, it always will be around. We ourselves need to take the responsibility to deal with it. It is true--we would like to have more money, better working conditions, better interpersonal relations. All those things are fine. But we are responsible for our own life and the better we know and accept it, the better we do in life. I am firmly committed to working with and promoting any kind of a method or device or system that will help people to become aware of their own problems and help them do something about them.

APPLICATION OF BIOFEEDBACK--A DISCUSSION

Donald L. Tasto, Ph.D.*

Robert Jordan has demonstrated to you that certain biofeedback techniques can be used to cultivate relaxation and lower arousal levels in the body. A question frequently asked about these techniques is: If you become very relaxed under laboratory conditions or in a clinic or doctor's office, can you take that learned relaxation state outside the laboratory and apply it to common situations that tend to make you feel highly aroused and tense? This is one of the issues I would like to discuss. The other concerns ways to make such a program acceptable to industry. I think the best way I can deal with both of these issues is to give you an example of an upcoming program that I will be conducting.

Starting in January 1978, I will be working with Dr. Meyer Friedman, author of *Type A Behavior and Your Heart*, on a behavioral intervention trial involving 900 post-coronary patients from the San Francisco Bay area. We have already visited several firms, and talked with medical directors, or, if the companies did not have medical directors, to personnel directors, in an attempt to identify prospective participants for this study. What is particularly interesting is that we are looking only for *post-coronary* participants. We know from the scientific literature that the Type A behavior pattern is predictive of early coronary heart disease. What we do not know is whether we can change that behavior pattern and, by doing so, change the risk associated with coronary heart disease. Let me briefly describe to you what we intend to do with these 900 post-coronary patients and tell you why I think industry may be interested in this process.

Dr. Friedman and I have decided to divide the total sample into smaller groups of ten. We do not believe it would be cost-effective to work with them on an individual basis. We will first be training them in relaxation techniques. For this particular study we will be using progressive muscle relaxation, not biofeedback. As described earlier, in this method one moves systematically throughout one's body, tensing and relaxing various muscle groups.

Next, we intend to ask participants to develop lists of those situations at the job, at home, or elsewhere, that tend to push up their arousal levels. And then, through the use of imagery, we are going to use a procedure which has been refferred to in the literature as "anxiety management training." While these individuals are relaxed we are going to ask them to envision the situations that kick up those high arousal levels. For example, we may have them imagine that the phone is ringing incessantly, that papers are piling up on the desk, and that a variety of typical things that they do not seem to have control over are happening. The normal response of Type A individuals to all of these stressors is to get anxious and highly aroused. On a typical day the anxiety may start out very low and gradually continue to rise. They may not be aware of it. It

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may be peaking as demands are increasing and events occurring over which they have no control.

Now we cannot, by definition, do anything about that over which we have no control. But what we can control is our reaction to these events. Some people, for example, can learn to let the telephone ring and stay completely relaxed. They learn to remain clam in the face of increasing interpersonal demands and excessive time pressures. It is not physiologically inevitable for us to become highly aroused and highly anxious when these pressures develop in the ambient environment.

As people learn to stay relaxed, even in the face of what have heretofore always been highly arousing situations and may have persistently caused them intense anxiety throughout their entire lives, their perceptions of those situations will begin to change.

Also, one can engineer out of people's daily lives some of the conditions that tend to precipitate high stress levels. We will be working with our subjects in an attempt to do just this--to alleviate or completely eliminate unnecessary stressors. If we can keep arousal levels under control, both by training people to stay relaxed in situations over which they have no control and by engineering some of the unnecessarily stressful things out of their jobs and family life situations, we think the following will happen.

These people will, we believe, become more congenial because they will be discharging some of the hostility that inevitably results from the frustration of trying to control the uncontrollable. We think they will also become objectively more effective than they were because the sharp fluctuation of arousal levels in response to external events often causes extreme fatigue. Type A's typically sleep more than Type B's because they get exhausted during a typical day. We try to get them to ask themselves, "Now you're letting yourself get overly concerned about this situation. How important will it be five years from now? How important is it as far as one year or even six months down the line are concerned?" And the answer is "Not very." If i is not important in the bigger picture, we want to get these people to start cutting and trimming some of these excesses out of their lives.

We anticipate that blocking out demands and reducing unnecessary commitments is itself going to cause some participants a fair amount of anxiety, and that we will have to continue to work with them on just how to go about staying relaxed and letting some things just happen. They have to learn that you do not have to have control over everything. You only need to have control over the important things.

But we are primarily hoping to reduce recurrence rates. Of a random national sample of people who have had a coronary, the expected recurrence rate over the next five years for that group is about 45 percent. Almost half will have another coronary within five years. Dr. Friedman's private patients have a recurrence rate of between 5 percent and 10 percent, a 400 percent reduction from the national norm, which was achieved by using the behavioral patterns I've sketched out here. We are attempting to replicate those results in our study.

As for making this program acceptable to industry, if we can reduce recurrence or even postpone it, we can save a company money. Heart attacks, particularly

early heart attacks, are extremely costly. If we can postpone, reduce, or prevent a heart attack, this will have an economic payoff. And it is quite possible to assess the cost-benefit of these programs. The cost of the program is easily assessed. The benefit can be measured by looking at the incidence and the prevalence of coronary heart disease national norms and comparing them with the incidence and severity figures for groups that receive behavioral training.

Some of the people we will be working with will be participating on their own time. Certain companies are letting us use their time. One told us, "This sounds to us like preventive medicine. We'll let our people charge it against their own sick leave and let them participate in this program during work time."

We realize that if we work with Type A's for a few days and then send them home, they may be okay for awhile. However, their old arousal patterns are gradually going to resume, and their proclivities for easily aroused irritability, hostility, working against time, etc., will return. So we plan to see these people initially in small groups for ten weeks, once a week. Then we are going to see them every two weeks for the next few weeks. After one year, we are going to be seeing them once a month to make sure they are continuing to follow through.

They also will be monitoring themselves. We are going to rely on their Type A tendencies to insure that they come to group meetings prepared to tell the group that they are doing something about their Type A behavior. This is one reason we expect the group technique to be more effective.

Among preliminary conclusions coming out of studies of groups of high-risk coronary patients is that the patients have previously gotten so wrapped up in what they were doing, they have not had time to pay much attention to interpersonal relationships. Another outcome of using groups is that the members often develop friendships, occasionally the most meaningful that they have ever had.

We also want to get spouses involved, primarily wives, since we have found that few women in industry have suffered heart attacks. We are going to be describing to them what it is we will be doing and enlist their cooperation. We are hopeful that this method will be effective.

SUMMARY
WHERE DO WE GO FROM HERE?

Jean S. Felton, M.D.*

I would like to pass on to you a few thoughts generated by the previous talks, along with a few issues which one would like to see develop in the future.

TODAY'S SCRUTINY

Living in today's society and in today's environment, we are subject to judgmental scrutiny no matter where we are. We are all in glass houses. If any of you have ever looked into the new glass buildings which have been put up in the downtown sections, you will find that the behavior of the people who are occupying office spaces in those buildings is completely different. One has to be careful of dress and what one does with one's hands. It is a much different kind of work setting from that in which one is completely enclosed in an office, shut off from the public. We are subject to other scrutinies as well. We have malpractice suits, we have a grievance system that we have to answer to periodically, and we have EEO complaints. We are responsible, we are being looked at, we have to be responsive--and this is stress-generating.

DISTANCE BETWEEN STRESSOR AND STRESSEE

Mention was made this morning of the individual in the subordinate position and the boss. The difficulty is that the boss is perfectly free to give orders, but he rarely interfaces with the people who are the recipients of those actions. Let me give you a couple of examples that go way back many years in my own life. As a house officer, I was scrubbing at another hospital for an operation with a man who had been my professor of surgery at school. He was removing a tumor from the patient's stomach, and the patient died on the table. In a very cavalier manner, he said, "Go tell the family." This was in a hospital where nearly all of the patients were Italians from the Latin quarter in San Francisco, and I, as a very junior member of that team, had to go and break the news to the family. What resulted, of course, was that every member of this family--and I ask you to believe me--began to bang their heads against the wall of the corridor of that hospital.

On another occasion--I was only a junior student at the time, substituting temporarily for an intern--a lady had come into the outpatient department presenting a little bump on her forehead. Eager as we all were at that undeveloped period in our careers to do surgery, permission was sought of this same professor, and he said, "Take out the lump." With all of the limited training that I had had, I began to do that, and I found that I could not dissect out the lump; it remained

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solid as I found myself deeper and deeper into the forehead. Finally, with some consultation while the wound was still open, I learned that this most likely was a syphilitic tumor. The patient was a forty-three-year-old spinster teacher, and in those days that was quite a message to give to that individual, which I was asked to do again by the same doctor.

Our bosses do not interface with the people they affect; they remain aloof and removed from the effects of their particular actions or orders they issue. They cannot be aware of the resultant stress.

ADMINISTRATORS VS. PROFESSIONAL STAFF

There was mention made this afternoon of something that is age old--the split in industry, and elsewhere, between administration and the medical services, or between the administration and the scientific personnel. We have this conflict situation all the time. Many years ago when I was associated with an atomic energy activity, we saw this going on between the scientists at work in the laboratory and the administrators. In those days, to use the parlance that was current then, one group complained, "Oh, those pencil pushers!" and the other group would respond with, "Oh, those longhairs!"

One of our scientists, who had made a tremendous contribution in physics thought that he would get even with the whole system and with what the administrators were trying to do. He was fortunate in being financially able to carry this out, namely, he would not cash his paycheck. So, as the computer each month would print out a paycheck for him, he would merely keep it. After three or four months went by, the company had to capitulate because he was upsetting the entire bookkeeping system; it simply could not go on that way. He was acting out his hostility and providing stress for those who were the administrators.

PRODUCTION VS. HUMANITARIANISM

I think all of us--and there were some allusions to this today--are aware of the complete orientation toward production on the part of industry today. Those of us who are in occupational health care are caught exactly in the middle between management, which is production-oriented, and those who are trying to carry out some humanitarian understanding and support. How many times have you been asked by persons in management, "Why don't you provide some kind of medical basis so we can fire this man?" Or, "Can we get him a disability retirement?" We are then caught in the middle, and we do not know which way to turn. If we ever capitulate, if we ever give in, that will be the last time that anybody will have any faith in us and our professional standards. So we must stand our ground, doing the best for the employee.

WOMEN AT WORK

Not enough emphasis was given today to the double role that women have who are in the working world. No matter what kind of private life is provided at home after 5:00 p.m. or so when they get there, there are tasks, duties, and responsibilities that cannot be shaken. If there are any family members, there has to be a shared participation and support. I believe this situation will always be with us and will always present a stress to the woman who is out earning a living, or more importantly, earning something to contribute to family support.

CHANGES AT THE WORKSITE

We are also finding that changes in a work setting to which one had been totally accustomed are becoming stressors. A few months ago, I was asked by an admiral at one of our naval installations, who was astonished by the tremendous increase in applications for disability retirement, to look at some of the reasons why people are taking this route out of a work career. After having gone over about 30 of the records I found that in the employees' statements--in the federal system one has to say why one is disabled--the words kept coming back, again and again, of "pressure," "stress," and "strain." These were offered by persons who no longer could cope because of new managers, new methodology, and new missions. I am sure that all of you have seen this happening, particularly those who have lived through the rise and fall of the space age and the phasing out of most of the space effort. These are people who find tremendous stress in jobs which, up to that point, they could cope with rather easily.

COSTS OF STRESS

We have not underscored sufficiently the cost factors of stress. There are impacts on retirement programs, on hospital and health insurance programs, on life insurance, and even on the contributions that companies make toward the unemployment insurance program. Now, when stress arises and the stress diseases that we talked about this morning result, there are costs. And these costs are being further compounded by the fact that we now have to abide by the dicta of the Rehabiliation Act of 1973, under which we have to hire almost everyone who applies for a job, regardless of his type of handicap. We wonder about productivity, and how much of a drain this is going to be on the emotional economy of the individual who is under stress.

QUESTIONS

I would like to ask a few questions that occur in connection with the study that was given in abstract form this morning. Would it be of interest if one were to study the differences between shift workers, the changes in shift workers, and those workers who are engaged in a consistent pattern of overtime? We are making demands on overtime, and I know right in our own work situation that we are trying now to find people in rather scarce craft categories, and these craftsmen will have to work overtime.

What is the role of education in the handling of stressors? What is the educational factor in some of these groups that have been studied? When we look at Tennessee---and I have had the fortune of having been there for about eight years--we see an entirely different culture. A great deal goes back to the mountain culture in which people grew up. As one goes through the small Tennessee communities one finds that there is a church, usually of a fundamentalist sect, on almost every block. What is the role of religion in this kind of population?

Another thing which has not really been touched on is the relationship of stressors to the development of cancer. Being in an industry where there is an indigenous carcinogen, we beg[illegible] to wonder who is going to develop the cancer and who is not--although all are working in exactly the same environment. I think there *must* be some strong, although not as yet demonstrable, relationship between stress and the development of a malignant growth.

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So where do we go from here? I think one of the most important issues is the sensitization of physicians. We must create awareness among physicians who are in the industry to some of the signs of stress. I emphasize the physician because it is he or she who hears the first symptoms or sees the first signs of stress that people develop. The physicians have to learn that people are not crooks, that is, there are deep, underlying reasons for the symptomatic behavior seen in industrial employees. For example, we have a group of men, a small group fortunately, who abuse the whole workers' compensation system; they are out time after time after time, gathering money which they have not earned. We have another group of people of the same age and in the same jobs who, when they are injured, are out perhaps two or three days and are back at work promptly. What is the difference between the two groups? I think these people are expressing some needs, and I am asking that the physicians be sufficiently honed so that they can identify these individuals and do something about their behavior-expressed needs.

The next step is getting to *specific* stressors and away from the concept of generic stressors. For example, we should not say that *all* foremen are stressors; we should pinpoint *this* particular foreman, or *this* supervisor, who is a stressor to a group of employees.

Next, we should sensitize managers to the feelings of people. I give you an example: just the day before yesterday, a man who had retired about two months ago came into my office. He was relating his experience in the retirement process. He said, "This has been probably the most severe psychological trauma I've ever experienced in my life. I used to come to work eight hours a day; it would take me a couple of hours in transport back and forth. Now I'm at home, I'm underfoot, my wife is there, and you have no idea what this has done to me." And he said, "Now let me tell you what happened when I retired where I was, without anyone showing understanding of what was happening to me as a person. I went to the personnel officer in my particular department, and the only thing that was of importance to that individual was that I turn in my identification badge and I scrape the parking decal off my car." This, I think, really epitomized the lack of sensitivity to what is happening to people in these situations.

During the break this afternoon, a person who is a counselor for one of the large organizations in this community explained to me the term they are now using--in trying to get away from individual counseling--in what he called systems intervention which, I think, is extremely good. In other words, they are trying to get to the *groups* of individuals who have responsibility for workers, rather than get to each individual who presents symptoms of some difficulty. All the reversing modalities have been touched on and, in fact, have been demonstrated beautifully here. These modalities are available to enable us to counteract and contravene some of the problems that arise.

Further, a plea is made that if one is going to add counselors, if one is going to add therapists, if one is going to add technicians, please make sure they are professionally trained. It is important that one does good and not harm. We are likely to get amateurs in this business, and we would hate to see that happen.

I would like to close, hoping that programs like the one today, what they stand for, and what they might motivate, continue to multiply. And what we need to do is bring these programs to the top managers, the people who are running the companies that we represent, to the people who may not be here today.

SUMMARY

WHERE DO WE GO FROM HERE?

Michael J. Smith, Ph.D.*

It is very hard to review all of the things that were presented today because there was so much covered. And to try to decide where we should be headed is an issue which boggles the mind. However, I have a few thoughts I would like to present which will hopefully stimulate you.

First of all, it is very clear to me that there is a great interaction between work-type stressors and off-the-job life stressors. Unfortunately, at the National Institute for Occupational Safety and Health (NIOSH) we have to concentrate on work-stressors. Also, unfortunately, the people that do the research on stress seem to specialize and concentrate in specific areas and do not take an overall systems approach to defining the problem. The effects of this stand out very clearly in our studies of occupational hysteria. If we do not look at all of the interacting effects--particularly how the homelife of women is affected when you give women overtime, how job factors affect their ability to function at home and how all of these factors interacting can reflect back on tension on the job--we are missing the boat.

The second point I would like to make is that in our stress studies we have found that it is very difficult to get access to good information--good health records, good surveys of what employees are feeling, what have you. One reason for this might be that we represent a federal agency and many people are reluctant to give information to us--and I really do not blame them for that. But I do wish some of you out in industry who have good records to work with, who could define stress problems, would do something about this lack. Do a small study. Write it up and turn it over to somebody so it can get disseminated; so we can try to get a better handle on what is going on out there that causes people to get sick.

The same thing holds true about stress-reduction programs. The two programs we heard about here today are excellent programs, from my point of view. But I never heard a thing about either of them before in my life. There has to be a forum for getting this kind of information out to you, and to me, so that I can disseminate it to others to use to reduce stress. Perhaps the universities could do something about this problem.

Management must be made to see a payoff in terms of what we are talking about here. We have to be able to convince managers that we can make an impact. For a number of years I spent my time trying to convince managers that a good occupational safety program is going to save money on workers' compensation costs. This was a very difficult task. In comparison, when you are talking about occupational health, coronary heart disease, ulcers, medical costs, and medical insurance, it should not be hard at all to convince managers that you can save a lot of money.

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Unfortunately, we do not have any studies looking at the cost benefits of stress reduction programs. Don Tasto's study has data that should be able to convince management. There should be more of this kind of research.

The specific stressors that affect women have not been studied to any great extent. And there is no question about there being elements about work that are specific to women--the kinds of jobs they have, the special problems they have--and these have to be studied. And they are not being studied now.

In terms of Dr. Felton's comments about the culture of Tennessee and how it may reflect on our study results, we are thoroughly convinced that our Tennessee study is not the definitive study that will once-and-for-all define high-stress occupations. In fact, we are being cautious about the results of our Tennessee study. I hope all of you will read our reports in the literature in which we explain what some of the problems with this study are. These types of studies have to be replicated. It is a first attempt to define the most stressful occupations. We need replications so that we can build up enough information for predicting who is going to have stress problems.

And, finally, I agree wholeheartedly with Dr. Felton in that we have to look at specific stressors. I think we are making a big mistake if we put all our eggs in one basket by looking only at things like machine pacing. While NIOSH keys in on specific general stressors because it is cost effective for us to define them this way, it does not mean that this method is going to solve all the problems. It is not. There has to be more research and more action taken at the plant level by people who know what the specific intricacies of the sources of stress at a particular work place are. That is something we will never know as researchers. We cannot get intimate enough with your work situation to understand that. You are the only people who can do that. So you are going to have to take information that is developed and tailor it to your own specific situation. Look at it and decide if this is going to work for you or this is not going to work for you. Do not just accept it whole and say "I'm Type A and I'm lost, and I'm going home now, and I'm just packin' it in." That just is not going to help you or others.

I would like to thank you for NIOSH for being here. I would like to leave you with this challenge. If you have anything that you would like to pass on to the federal government, to NIOSH, any ideas you have, any information you want--please get in touch with me. I would be glad to talk to you any time, because I can always use advice.